

PACIFIC RADIO NEWS

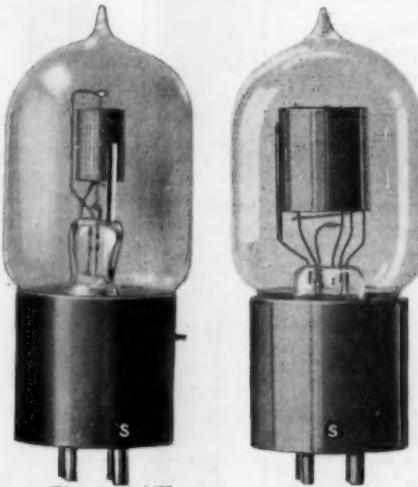
*Pioneer Journal of
Western Radio News and Development.*

why the navy did it—

The U. S. Navy Department uses vacuum tubes equipped with a special patented base insulated with **bakelite**—the SHAW base. The Navy Department adopted the SHAW base because the **bakelite** insulation stops leakage and prevents the absorption of atmospheric moisture. The SHAW **bakelite** base is an exclusive patented feature of A-P tubes and is found in no other tubes but **A-P tubes**.

When you want an **efficient** amplifier in which none of the amplifier qualities are sacrificed to make it also a detector, use the **A-P VT Amplifier-Oscillator**. When you want an **efficient** detector in which none of the detector qualities are sacrificed to make it also an amplifier, use the **A-P Electron Relay**. Only A-P tubes are equipped with the SHAW standard, four-prong, **bakelite** base.

For sure results, for better results use A-P tubes and only A-P tubes—equipped with the SHAW standard, four-prong **bakelite** base (patented).



Only a combination of tubes provides all necessary operating characteristics without compromising essential features. A combination of two or more A-P VT tubes as amplifiers with an A-P Electron Relay as the initial detector or oscillator is the ideal receiving combination for long distance amateur or long wave reception. This is the one vacuum tube combination on the market today proven in actual use.

Your dealer has A-P tubes. Accept no others. Or, if no dealer is handy, write us direct.

Licensed by the Radio Corporation of America under DeForest Audion and Fleming patents for amateur and experimental use, in radio communication.

PACIFIC RADIO SUPPLIES CO.
638 Mission St., San Francisco, Cal.

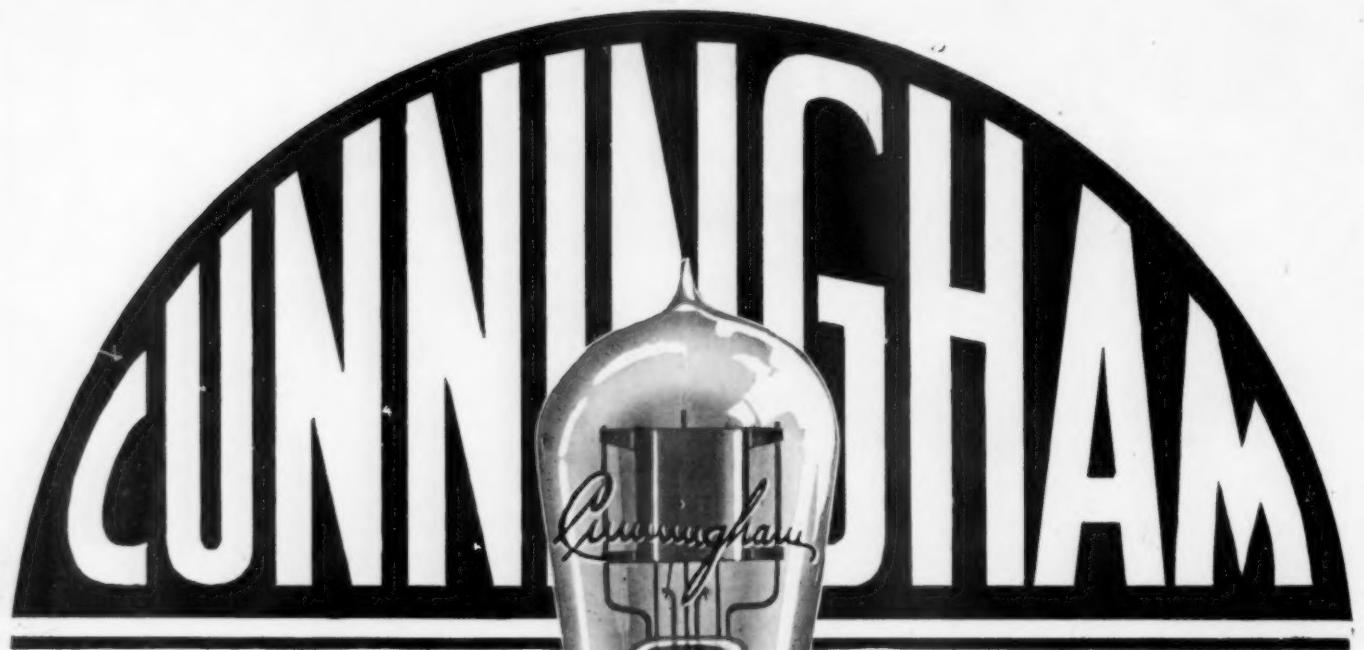
ATLANTIC RADIO SUPPLIES CO.
8 Kirk Place, Newark, New Jersey

Distributors for Moorhead Laboratories, Inc.



2-7





**DETECTOR
TYPE
With Standard**



**TUBE
C-300
Four Prong Base**

TYPE C 300 invites comparison. Amateur requirements decided its design. Many years research of vacuum tube properties have made Type C 300 the Ideal Amateur Receiving Tube. Detector sensitiveness at low plate voltages requires that gas action be combined with the electron emission and by a WONDERFUL NEW PROCESS OF MANUFACTURE this gas action is so controlled that the plate voltage for maximum signal audibility is always within the limits 18-22½ volts. Only a single block cell is needed in the plate circuit—a big saving in battery investment. Type C 300 is completely silent in operation—a decided advantage in receiving weak signals.

Any three member vacuum tube is necessarily an amplifier, but the results obtained from Type C 300 as a tone frequency amplifier with only 22½ volt plate battery proved a surprise. Again,

Type C 300 invites comparison. Competitive tests show this tube to excell any tone frequency amplifier previously developed. For power amplification in operating loud speaking telephones and in complex and multistage circuits, use the special Pliotron amplifier Type C 301 for freedom from distortion.

Write for special Bulletin C 301.

Type C 300 is a free and persistent oscillator for regenerative amplifications and CW reception.

The pleasure and satisfaction from operating Type C 300 cannot be described.

See your dealer today—or write for his name and copy of Bulletin C 300.

Type C-300

5.00

TRADE AS

AUDIOTRON MFG. COMPANY

35 MONTGOMERY ST., DEPT. N

SAN FRANCISCO

EVERYONE

who is interested in SHORT wave radio communication, and C. W. work **KNOWS** that Radio Shop receivers are "delivering the goods."

Until recently we have devoted our energies exclusively to short wave products, but now our manufacturing facilities are such that we may offer to the field the latest RADIO SHOP development for those who are interested in long wave reception, THE RADIO SHOP LONG WAVE RECEIVER.

This set not only includes the tuning inductances and capacities, but also a standard Radio Shop Audion control unit. The general appearance and workmanship is identical with our Short Wave Receiver and embodies features that will appeal to the most discriminating. Circuits are so synchronized that practically the entire range of wave lengths are covered with two controls, eliminating the troublesome "hard-to-find" condition which is encountered in almost all long wave receivers now on the market. With this receiver it is unnecessary to experiment for weeks before results are obtained. It works from the start and keeps right on working under all conditions. You can always find your station, and always at the same adjustment. This is on account of the arrangement of controls which entirely eliminates undesirable combinations. The wave length range is from 1,000 to 25,000 meters and stably oscillates over the entire range. Practically all European high power stations have been copied at our plant at San Jose on an antenna thirty feet high and fifty feet long. This was WITHOUT any steps of amplification.

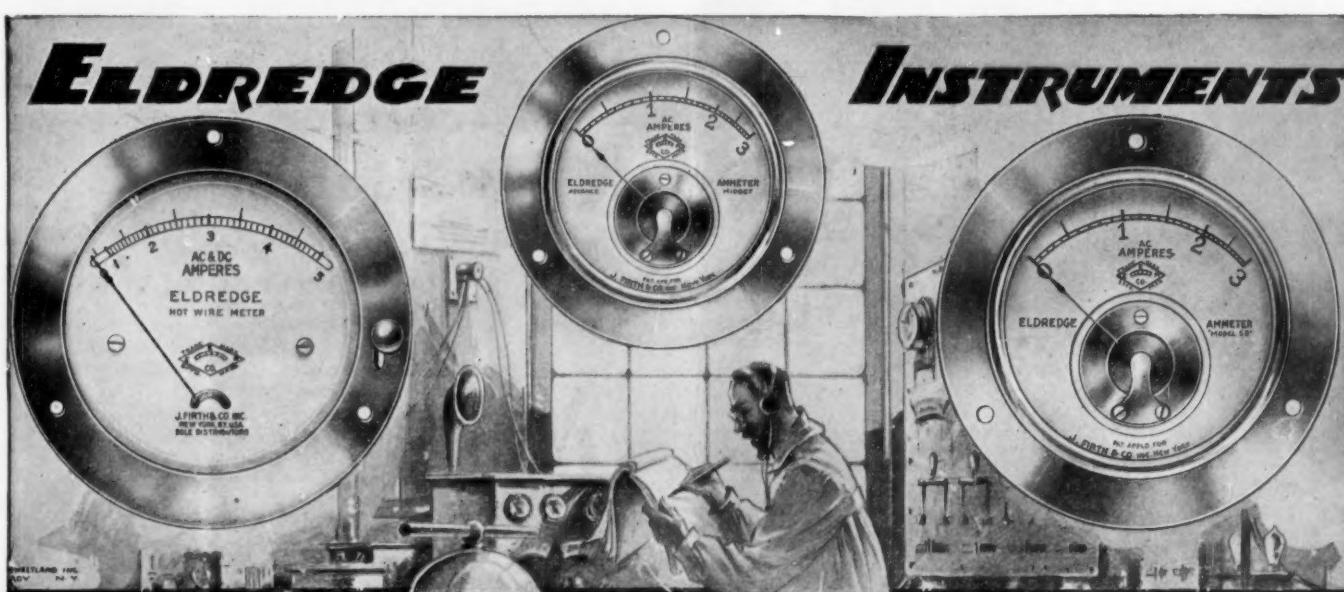
The price of THE RADIO SHOP Long Wave Receiver, complete with Audion Control in same cabinet, is Seventy-five Dollars.

Descriptive matter on this receiver will be off the press shortly. Write for your copy now.

"RADIO SHOP" PRODUCTS ARE LABELED AS SUCH. DO NOT ACCEPT ANY APPARATUS THAT DOES NOT BEAR THE "RADIO SHOP" LABEL AND YOU WILL BE ASSURED OF UTMOST SATISFACTION AND RESULTS.

All RADIO SHOP products are sold with our "money back, if not satisfied" guarantee which we feel is our best assurance of value and satisfaction.

The Radio Shop SAN JOSE CALIFORNIA



Absolute Dependable Accuracy—Low Priced

The Wireless amateur has always asked for a set of good looking, neat and compact electrical measuring instruments that were unfailingly accurate and reasonably priced.

ELDREDGE Instruments fill all of these requirements. They are designed and manufactured by a firm world renowned for creating the most accurate type of miniature electrical measuring instruments.

Notes on all types: Scales calibrated individually to ensure absolute accuracy—polished nickel finish—flush mounting.

RADIO FREQUENCY AMMETERS AND MILLI-AMMETERS. Overall diameter $2\frac{1}{8}$ ". Ranges 0-600 milli-amps, 0-1, 3 and 5 amps. Price, \$7.00.

ADVANCE "MIDGET" AMMETERS AND VOLMETERS. Ideal for small panel mounting. Embodies the improved French movement. Supplied in 12 ranges for D. C. and A. C. Price \$8. Overall diameter $2\frac{1}{8}$ ".

MODEL S-D, A. C. AMMETERS AND VOLMETERS. Designed especially for 60 cycle transformer primary circuits. Overall diameter $2\frac{1}{8}$ ". Voltmeters, \$10.00; Ammeters, \$9.50.

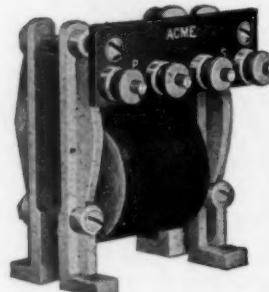
Ask your dealer for literature on these instruments. If he cannot supply you, write us direct, giving his name and address.

JOHN FIRTH & CO., Inc., 18 Broadway, New York

ACME APPARATUS

Amplifying Transformer

The Heart of the Amplifier



CW Power Transformer

May be used with rectifying tubes or for high voltage A. C. on Power tubes.
Filament heating windings provided.

WRITE FOR BULLETINS
CARRIED IN STOCK BY LEADING DEALERS

ACME APPARATUS COMPANY

**21 WINDSOR ST.
Cambridge 39, Mass.**



Number 766

SEVEN SIXTY-SIX

Contains fifteen cells connected in series; solidly packed and sealed in paraffine; topped with half an inch of sealing wax rendering the unit absolutely waterproof and not effected by climatic changes.

One positive and one negative lead, both of insulated cord six inches long.

Dimensions over all: 6½ in. x 4 in. x 3 in. deep.
Voltage 22½ V.

This battery is particularly adapted to the use of the beginner and will give long and faithful service.

EVEREADY Wireless "B" Batteries

SEVEN SEVENTY-FOUR

Made up of twenty-seven cells connected in series. The wooden case containing this battery is coated in melted paraffine with a half-inch of sealing wax added after the cells are in place, making of the whole a unit impervious to moisture.

One negative and six positive terminals. All terminals have heavy brass screws and nuts. This battery allows a range of 18 to 43 volts in steps of 4½ volts.

Dimensions over all 9 in. x 3⅓ in. x 3½ in. deep.
Suitable to a wide range of requirements, this type of wireless battery, will meet the needs of those who demand the best.

Number 774



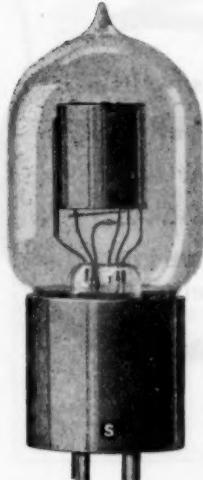
The National Carbon Co., Inc.

San Francisco

Los Angeles

599 Eighth St., San Francisco

FREE TUBES!



The A. P. V. T. Tube
Regular price, \$6.00 for
the Electron Relay and
\$7.00 for the Amplifier-
Oscillator.



The New Cunningham
Audiotron
Regular price \$5.00. All
tubes shipped immedi-
ately. NO DELAYS!

Get four of your radio friends to subscribe to "Pacific Radio News" for one year. Send us eight dollars for these four subscriptions and 25 cents for mailing charges. We will promptly send you a vacuum tube absolutely free of charge. If you cannot get four individual subscriptions, get two of your friends to subscribe for two years each. These tubes will also be awarded to you if you subscribe as an individual for four years. If you are already a subscriber you can extend your subscription for four years. In short, any combination for which you send us eight dollars will be accepted. All tubes are new and genuine and fully guaranteed by the manufacturer.

WHEN ORDERING VACUUM TUBES SPECIFY WHETHER YOU WANT THE A. P. DETECTOR, OSCILLATOR OR AMPLIFIER TUBE OR THE NEW CUNNINGHAM AUDIOTRON.

WHY NOT EXTEND YOUR PRESENT SUBSCRIPTION?

Subscription Rate \$2 per year

PACIFIC RADIO PUBLISHING CO.
50 MAIN ST., SAN FRANCISCO

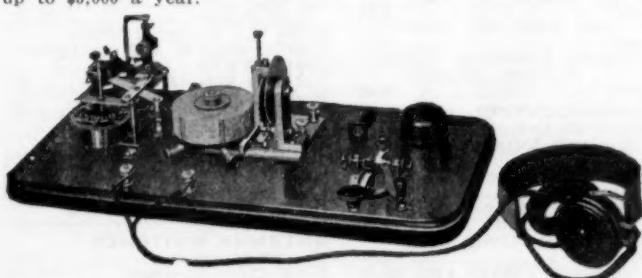
LEARN WIRELESS AT HOME

The Demand
for Good Wireless Operators
Far Exceeds the Supply

The New York Wireless Institute will make you an operator—AT HOME—in your spare time—quickly, easily and thoroughly. No previous training or experience required. Our Home Study Course has been prepared by Mr. L. R. Krumm, formerly Chief Radio Inspector, Bureau of Navigation, N. Y. He resigned last August to accept a position of still greater responsibility with one of the largest Commercial Radio Corporations in the United States. Radio experts able to impart their practical and technical knowledge to YOU in an easy to understand way will direct your entire Course. The graded lessons mailed you will prove so fascinating that you will be eager for the next one. The instruments furnished free will make it as easy to learn the Code as it was to learn to talk. All you will have to do is to listen.

BIG SALARIES

Wireless operators receive excellent salaries, ranging from \$125 to \$200 a month, and it is only a stepping stone to better positions. There is practically no limit to your earning power. Men who but yesterday were Wireless Operators are now holding positions as Radio Engineers, Radio Inspectors, Radio Salesmen at salaries up to \$5,000 a year.



This wonderful Set for learning the Code furnished free with our Course.

TRAVEL THE WORLD OVER

A Wireless Operator can visit all parts of the world and receive fine pay and maintenance at the same time. Do you prefer a steady position without travel? There are many opportunities at the numerous land stations or with the Commercial Wireless or with the Steamship Companies.

FREE INSTRUMENTS AND TEXT BOOKS

We furnish free to all students, during the Course, the wonderful receiving and sending set exactly as shown in the illustration. This set is not loaned, but given to all students completing the Course. One cell of dry battery all that is required. No additional wiring aerials, etc., needed.

The Transmitter shown is the celebrated **Omnigraph** used by several Departments of the U. S. Government and by the leading Universities, Colleges, Technical and Telegraph Schools throughout the U. S. and Canada. Start the **Omnigraph**, place the phone to your ear and this remarkable invention will send you Wireless Messages, the same as though you were receiving them through the air, from a Wireless Station hundreds of miles away. When you apply for your license, the U. S. Government will test you with the **Omnigraph**—the same model **Omnigraph** as we furnish to our students. Ask any U. S. Radio Inspector to verify this.

WIRELESS TELEPHONY COURSE

We have incorporated in our Institute and up-to-date and complete Course in Wireless Telephony, written by our Chief Instructor, Mr. L. R. Krumm. This Course is also furnished free.

FREE POST-GRADUATE COURSE

A one month's Post-Graduate Course, if you so desire, at one of the largest Wireless Schools in New York City. New York—the Wonder City—the largest port in the World and the Headquarters of every leading Wireless and Steamship Company.

The Department of Commerce of the U. S. Government, recognizing the value of the instruction furnished by us, allows all of our graduates a five-point credit in their examination for first-grade license.

The U. S. Shipping Board will also testify as to the value of this instruction.

America's Fastest Growing Wireless Institute. There must be a good reason. There is—

The Best Course in Theory available.

The Best Instruments obtainable.

The Best Text Books and Diagrams on the market.

EASY PAYMENTS

A small payment down will enroll you. We will make the payments so easy that anyone ambitious to enter the fastest growing profession—Wireless—may do so.

SEND FOR FREE BOOKLET

Without obligating you in any way, send for our booklet, "How to Become an Expert Wireless Operator"—it is free. Mail the coupon below, or postal or letter—but do it today.

NEW YORK WIRELESS INSTITUTE

Dept. 77, 258 Broadway

New York City

New York Wireless Institute

Dept. 16, 258 Broadway, New York City

Send me, free of charge, your booklet, "How to Become an Expert Wireless Operator," containing full particulars of your Course, including your Free Instrument offer.

Name

Address

City or Town.....State.....



Licensed Under Armstrong and Marconi Patents

Be sure its a
real PARAGON
Look for the phrase
TYPE R. A. TEN
engraved in the
bakelite panel

If it isn't an R. A. TEN, it isn't a PARAGON

Outstanding features of the Genuine PARAGON R. A. TEN

(Reg. U. S. Pat. Off.)

Amplifying Short Wave Receiver

Wave length, 160 to 1000 meters.

Amplification 100 times.

No dead end losses whatever.

Vernier attachments on all controls.

Coupling has scale of 180°.

Free from all body capacity effects.

Guaranteed for two years.

"The weaker the signal, the stronger the amplification"

PRICE EIGHTY-FIVE DOLLARS

THIS ADVERTISEMENT is published more for your protection than ours. Of course, we have known all along that imitators were using the PARAGON name, but only recently did we realize how radio men were being deceived. Letters have come in, however, from a number of amateurs who bought these fake Paragons, and were tremendously disappointed.

Probably there are hundreds more who do not realize the real situation.

The genuine PARAGON R. A. TEN (*use full name*) is manufactured only by Adams-Morgans Co. and is sold exclusively by Continental and affiliated dealers. The complete name is copyrighted, and the use of the PARAGON name on other instruments is therefore not only unfair and deceptive, but also illegal.

Two previous models of Adams-Morgans Co., the PARAGON R. A. 6 and the PARAGON R. A. 200 Universal Range receiver, are of course genuine. However these models are now discontinued and the PARAGON R. A. TEN is the only genuine PARAGON on the market.

Be sure to get a PARAGON—a *real* PARAGON—the only receiver with a wave length range up to 1000 meters, combined with no decrease in amplification.

Send in your remittance now, and your PARAGON will be shipped at once.

Or, let us send you our FREE bulletin, describing in detail, the features of the PARAGON R. A. TEN.

THE SAME courtesy—the same helpful attention that has pleased our customers here in the store, extends to our mail order department. We ship exactly what you order, the day you order it—and it's packed to arrive in perfect condition.

Our new 112 page catalogue, now out, contains probably the widest assortment of radio goods ever assembled together. The appendix contains tables for easily figuring all radio calculations, also conventional signals and abbreviations, etc. This valuable catalogue mailed anywhere in the world for 25c. Send for your copy today.

Partial List of our Mail Order Specialties follows. Order direct from this ad, and then send for complete catalogue.

Radiotron Detector Tubes \$5.00
Electron Relay Det'r Tubes 6.00
Electron Relay Amp. Tubes 7.00

OMNIGRAPHES

No. 313	Omnigraph Com.	\$20.00
No. 2 Jr. Complete.....	28.00	
Extra Dials, each.....	.20	
No. 342 Practice Set with battery.....	4.00	
BUZZERS		
No. 55 Mesco.....	\$2.50	
No. 251 Mesco.....	.90	
No. 168 Century.....	2.50	
AMRAD GAPS		
No. G-1 1 K.W. Gap.....	41.50	
No. G-2 ½ K.W. Gap.....	24.50	
No. G-3 ¼ K.W. Gap.....	12.00	
BENWOOD GAPS		
No. 1 Benwood Gap, complete.....	30.00	
No. 8 8 Stud Rotor.....	8.00	
No. 10 10 Stud Rotor.....	8.00	
No. 14 14 Stud Rotor.....	8.00	
LINE PROTECTORS		
No. 379 Murdock Line Protector.....	9.00	
No. AM888 Dubilier Line Protector.....	4.00	
No. CD888 Dubilier Line Protector.....	6.00	

TUNGAR RECTIFIERS

Two Ampere Tungar complete.....	18.00
Five Ampere Tungar complete.....	28.00
Two Ampere Extra Lamp.....	4.00
Five Ampere Extra Lamp.....	8.00

BURGESS "B" BATTERIES

22½ Volts Large "B" Battery.....	3.50
22½ Volts Small "B" Battery.....	2.50

PARAGON CONTROL PANEL

No. 5 Paragon Control panel.....	6.00
----------------------------------	------

AUDION CONTROL UNITS

Radio Craft Detector Units.....	15.00
Radio Craft Detector and 1 Stage.....	50.00
Radio Craft Detector and 2 Stage.....	70.00

RADIO CRAFT UNITS

Radio Craft 2 Stage.....	50.00
RORA Grebe Unit.....	12.50
RORH Grebe Unit, with batteries.....	17.50
RORE Grebe 1 Stage Amp.	25.00

RORJ Grebe 2 Stage Amp. 50.00

RORG Grebe Det. & 1 stage 47.00

RORD Grebe Det. & 2 Stage 75.00

P-400 De Forest Unit.... 12.00

P-401 De Forest Unit with Cabinet..... 14.75

P-402 De Forest Unit with 40 V. Battery..... 22.00

P-500 De Forest Audion, Ultra Audion with 40 Volt Battery..... 25.00

P-200 De Forest 2 Stage Amp. with 40 volt Batt. 70.50

RHEOSTATS

No. 2110 Porcelain Base... 1.40

Paragon back mounted.... 1.75

G. R. back mounted..... 2.50

GRID LEAKS

Marconi complete with holder and leak..... 1.25

No. ROCA Grebe Condenser and leak..... 1.60

G-100 De Forest Variable leak..... .75

ANTENNA SWITCHES

No. 463 Murdock..... 4.50

F-658 Clapp-Eastham..... 12.50

Our word of honor to you is our guarantee.—Let us prove it!

Continental Radio and Electric Corporation

J. DI BLASI, Secretary
DEPT. G 71.

Sole Distributors of the Paragon RA-TEN
6 WARREN STREET

J. STANTLEY, Treasurer
NEW YORK

JAN 26 1921

©CLB486046

VOLUME II

FEBRUARY, 1921

NUMBER 7



THE PACIFIC COAST ADVISORY COUNCIL

THE Pacific Coast Radio Convention went on record as favoring the formation of a Pacific Coast Advisory Council for the purpose of arbitrating, adjusting, and acting on such proposals as may be presented to it from time to time. With the close of the convention the work of the Council should not come to a close. To date nothing has been accomplished. Why? Simply because the Council has not received the support of the Western radio men. Nothing has been submitted to date and nothing has been heard in regard to the activities of the newly-formed body of the Pacific

Coast's leaders in the radio profession. You can hardly expect anything from the Council unless you submit something for adjustment, arbitration, or otherwise.

If you have something up your sleeve, now is the time to let it out.

If you want a square deal on the Pacific Coast the Council will see that you get it. The first meeting of the Council is scheduled to take place during the latter part of February and you may rest assured that if the Council comes to order without a single issue presented to it for adjustment it may never meet again.

Therefore, those of you who want ACTION on any question, whatsoever, must take the first step—the Council will do the rest.

What better combination of radio men at your service can you ask for than Major J. F. Dillon, Captain C. I. Hoppough, the District Radio Superintendent of the navy, the Pacific Coast representative of the U. R. T. A. the Radio Supervisor of the U. S. Shipping Board and Mr. A. E. Bessey of the A. R. R. L.?

Show these men that you want the help of the Council by asking them for help. None of them are mind-readers.

MONEY—EFFICIENCY—SUCCESS

THOSE three words look good to about 99.9 per cent of the radio people. Everybody wants money, wants efficiency everywhere, and ultimately everyone wants to succeed.

And is efficiency always desirable? In a radio set, yes, but it is not always right elsewhere. Efficiency often treads on the wrong persons; it asserts that might is right, and we have heard and seen enough of that principle in the recent war. Efficiency doesn't work with human beings—it's place is with the material things like our radio apparatus. Today, in the land of radio, amongst the factories, the cry for MONEY has brought about a distinct influence on the development of radio apparatus and radio principles. The outgrowth and advancement of any science is always by the process of evolution. Regenerative circuits of today were not hap-

pened upon, nor did they grow; but they were evolved from a simple beginning to the present-day efficiency. So it has been with the whole science of radio; it has evolved from a simple beginning. During the early years of radio, development was much more rapid than it is today, greater inventions were brought forth, and more phenomenal results were heard of than now. These early years in radio were the days when MONEY was not an ultimate goal to be striven for, and the great men of those days were real altruists. Their discoveries, and the contribution they gave to the science comprised their reward, and it is true that few of them died rich. Present-day development has slackened. Manufacturers figure everything on a production basis. The production engineer has so far encroached upon the research engineer that he has even influenced the design of apparatus to a great

extent, in order that more pieces could be made per minute.

Where is the efficiency when the trend of modern radio advancement is not in the direction of best results for least expense, but, instead, in the direction of more profit, less service?

What the war hasn't done to the radio game in this country isn't worth mentioning. But out of the clouds of the war is coming a light. MONEY is getting tight, conditions are clinching up, and the market is flooded with goods at one price.

It's all easy to see. As usual, the RIGHT WINS. The parasites of modern radio evolution are getting their own medicine, and are gradually disappearing, one by one. The SUCCESS that they looked for never came. It wasn't what they expected. But it all works out for the good.

ELSEWHERE in our pages is an article by Mr. L. Mott of Catalina Island that deals with "fish stories" by radio. We shall watch with interest the result of Mr. Mott's efforts to broadcast the fishing news from the famous waters about the Island, and we venture the prophecy that inland dwellers, far removed from the breakers' curl, and the

songs of the salty winds through the rigging, will get a decided thrill at being able to hear, each night, of the day's doings on the Island. We trust that our Southern brothers will take the brick off the key for just a few minutes each night in order to allow Mr. Mott to proceed with the new sport—not for his own good, but for your good, and

your good alone. Get out of the habit of "laying for the fellow with the noisy spark." Sit back in your chair for a while, smoke a big, black cigar and get a kick out of the game for a change. Let the ether smile for a few moments—it's beginning to shrivel up from the effects of the QRM injected into it by the dynamiters of the air.

New York Office.....147 Sixth Ave.
Boston Office.....18 Boylston St.

Portland Office.....420 Bd. of Trade Bldg.
Chicago Office.....1306 Hartford Bldg.

Seattle Office.....419 Pioneer Bldg.
London Office....62 and 8a, The Mall, Ealing

Entered as second class matter January 22, 1920, at the Post Office at San Francisco, Cal., under the Act of March 3, 1879.

VARIOMETERS

(By Robert Velner)

THE latest is variometers. Everybody uses them if they wish to bring in those distant stations. A regenerative receiver requires two variometers,

students a chance to make something in which they are especially interested.

The first consideration is the wood for making the forms. Hard maple is the

istence, with the exception of some rarer woods grown in foreign lands. It is of such a nature that, if well seasoned, as it should be for these forms, it will never shrink enough to cause the wire on the forms to loosen.

Figure 1 shows the rotor, Figure 2 the stator. The dimension B, Figure 1, should be about $2\frac{1}{2}$ inches. Since the usual maple obtainable is not thick enough to make this width, it is customary to glue two pieces of $1\frac{1}{4}$ -inch material together. For two variometers two pieces of hard maple, $1\frac{1}{4} \times 4\frac{3}{4} \times 9\frac{1}{2}$ inches glued together, and then sawed in half, to make two pieces $2\frac{1}{2}$ inches thick by $4\frac{3}{4}$ inches square, will be required. The dimension A, Figure 1, will be $2\frac{1}{4}$ inches if the above size wood is used. Throughout this article dimensions for efficient variometers will be given for the grid and plate circuits of a regenerative receiver, but the builder may vary the dimensions to suit his special needs or ideas.

For the stator forms, four pieces (for two variometers) are required, also of hard maple, $5\frac{3}{4}$ inches square by $1\frac{1}{4}$ inches thick. These should be nicely squared up and sandpapered, to make a neat job.

After the wood is procured, templates must be made for turning up the rotor and stator forms and for the winding form for the stator coils. These can be made of cardboard if only two variometers are being made, but should be of sheet iron or steel if a large quantity are to be produced. Figure 1 A shows the template for the rotor form, Figure 2 A for the stator forms, and Figure 4 A for the winding form.

It is advisable to start in with the rotor form. Mount the $2\frac{1}{2}$ -inch glued wood block in the lathe so that it will rotate on centers to make a circular wood block $2\frac{1}{2} \times 4\frac{3}{8}$ inches in diameter. This diameter will allow for the dimension C, Figure 1. After this cylinder has been

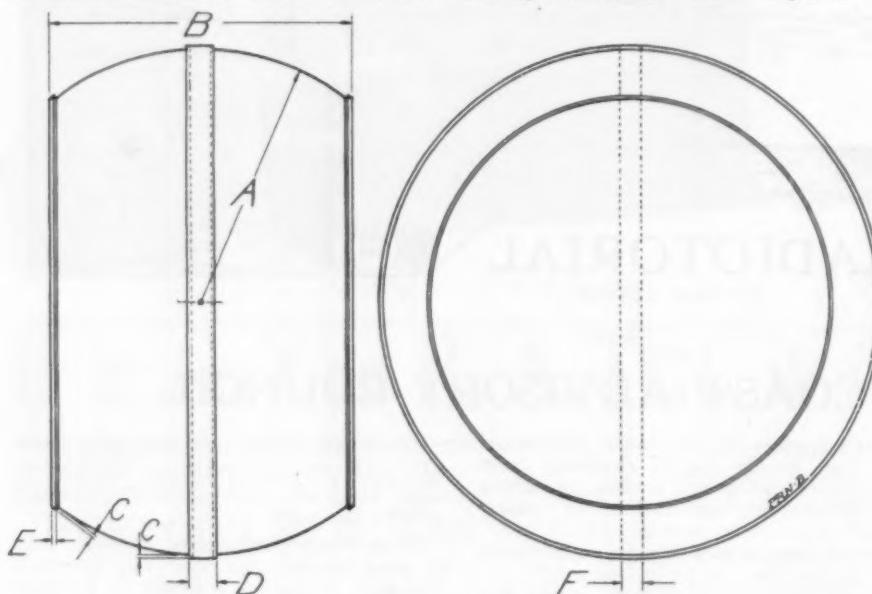


Figure 1 Rotor - Hard Maple

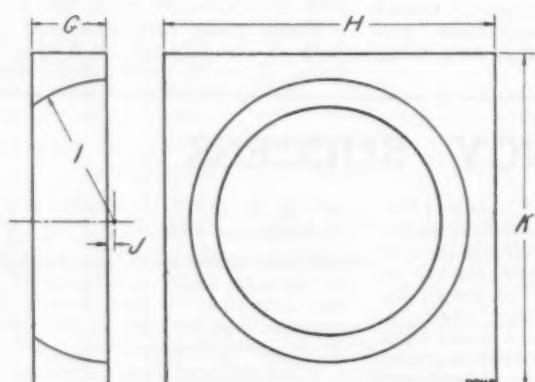
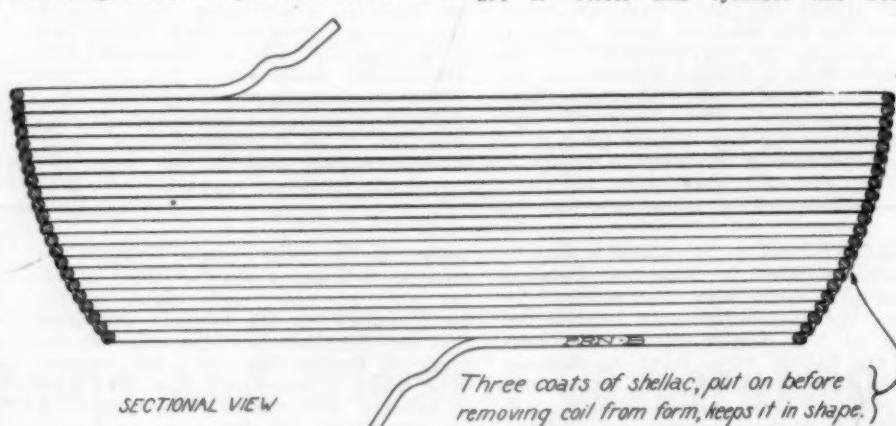


Figure 2 Stator (Half)-Hard Maple

and this type of receiver is the most efficient one for the vacuum tube. Many amateurs enjoy making their own apparatus, and many others cannot afford to buy their equipment "ready made." It is for these amateurs that this article is written.

For the construction of these variometers a small wood turning lathe, just large enough for turning pieces 6 to 8 inches in diameter, is necessary. Many amateurs who do not own lathes can use them at schools, where, if the subject is approached in the right way with the manual training instructor, they can do all the wood work necessary for these variometers. The forms for the variometers certainly are pieces which require more than ordinary care to make right, and the instructor of any class in wood turning should not hesitate to allow their pupils to make them and thus give his

right wood to use, because it is about the closest grained, non-porous wood in ex-



Three coats of shellac, put on before removing coil from form, keeps it in shape.

Stator Coil removed from Winding Form

Fig. 3.

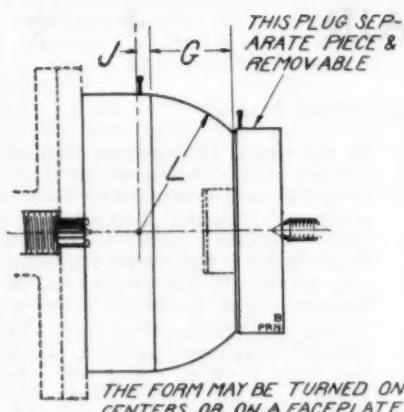


Fig. 4 Form for Stator Coils

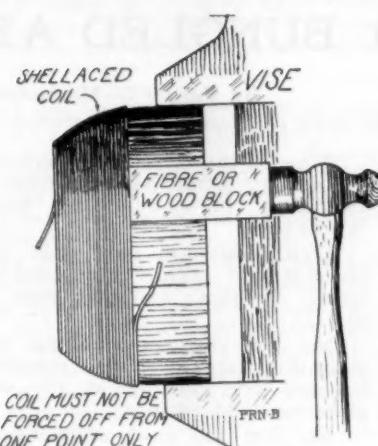


Fig. 5 Removing Coil from Winding Form.

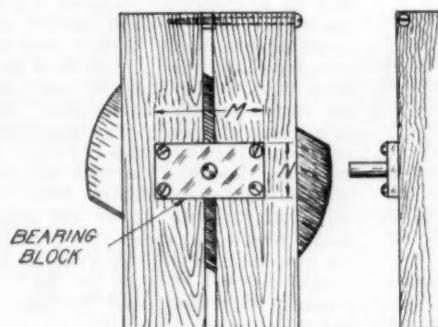


Fig. 6. Variometer Assembled

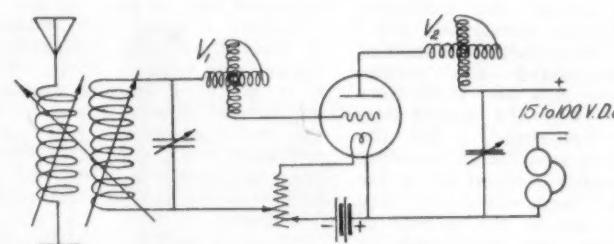


Figure 7 Regenerative Receiver Diagram.

turned out, mark the width of the ridge D, in Figure 1, at the middle of the cylinder. This should be $\frac{1}{4}$ inch. Then turn down on either side of the ridge $\frac{1}{2}$ inch and start to round off the form to the shape of the template. Be careful not to turn too quickly, but take time and use the template frequently. It is easy enough to turn off more wood on the form, but impossible to put more on, once it is below size. In turning maple, which is a very hard wood, tools must be continually sharpened. They must be held very firmly in the hand to prevent turning the form out of round.

When the two rotor forms have been turned, mark two places on the ridge exactly diametrically opposite. These marks are to cote the hole to be drilled through the center of the form. Place a drill in a chuck in the headstock of such size that it will drill a hole to make a drive fit for the brass rod to be used as the rotor shaft. $\frac{1}{16}$ inch round brass rod is a good size, and the drill should be about $1/100$ inch smaller in diameter than the rod in order to make a tight fit. The drill may be tried out on another piece of wood first, to avoid possibility of ruining the rotor form. Center-punch the holes which you have marked at opposite sides of the rotor form and place the form in the lathe, bringing the dead center up until it fits into one of the center-punch holes in the form, the other center-punch mark being close to the point of the drill. Then turn the hand wheel of the tailstock, feeding the drill slowly into the wood

until half through the form. Then reverse, placing the dead center into the drilled hole and drilling from the other side. Caution is to be taken in doing this work. The drill must be sharp and the wood must be fed slowly into the drill. If these precautions are observed, and care is taken to see that the drill starts right in the center of the ridge, satisfaction will be certain.

When the hole is drilled the form may be again placed in the lathe and wound.

edge may be fastened by drilling a small hole about the same size as the wire at the edge of the rotor form. Small holes must be carefully drilled from where the holes come out for the shaft to the outside of the rotor in order to lead one end of the wire to one end of the shaft, which is in two pieces, and the other end of the coil to the other end of the shaft. About one-half of an inch air space in the hole, at the center of the rotor, will

(Continued on page 220)

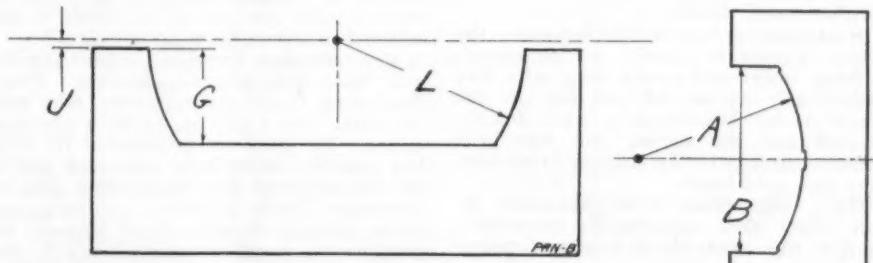


Fig. 4A Template for Winding Form

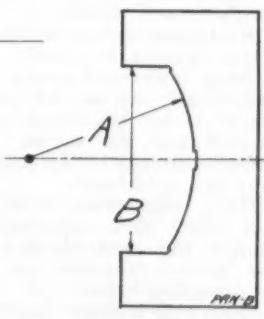


Fig. 1A Template for Rotor Form

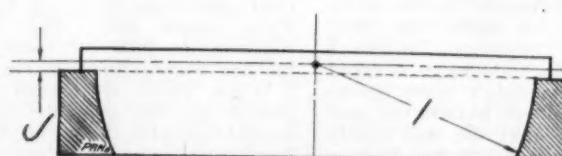


Fig. 2A Template for Stator Form showing section of Stator Form.



A BUNGLED AFFAIR

By Volney G. Mathison

Author of "The Radio Development Association of Hamsville," and Others.

AS per schedule, the "Yosemite," small and dirty Pacific Coast steam-schooner, loaded lumber at St. Helens. Also as per regular schedule, the wily and silver-tongued steamer-ticket agents in Portland roped in some fifty or sixty unsuspecting land-lubbers and hypnotized them into parting with quite a number of perfectly good American dollars, in exchange for which the victims received long, pink tickets, entitling them to a "first-class" passage to San Francisco on the new, magnificent, and luxurious (?) steamship "Yosemite."

On the day the "Yosemite" was due to sail, the afore-mentioned land-lubbers were herded aboard a little river boat and were taken down the Columbia River to St. Helens, twenty-five miles below Portland. Here they were hustled aboard the dilapidated old steam-schooner, the gangplank and lines were quickly taken in, and the engine-telegraph signaled "full-ahead." By the time the crowd of provincial travelers had awoken to a tardy realization of the fact that they had been victimized, they found themselves out in the middle of the broad Columbia, and very much up against the necessity of staying aboard and making the best of a bad deal.

As usual, some of the more militant of the humbugged ones raised quite a fuss. A particularly strenuous protester was a small, dark-complexioned man, who had a conspicuously nervous manner, and who seemed to be afflicted with a very snarly disposition. He had a small, black satchel, which he appeared to be determined to not let out of his hand for a moment. After poking his nose into his two-by-four stateroom, and then, accidentally, wandering into the sailor's mess-room, where he saw a gang of terrible Finns devouring huge platters of codfish and corned beef, he decided, evidently, that he had seen enough. He demanded to be told where he could find the captain of the vessel, and was informed that the master's quarters were on the upper deck.

Hastening up a companion-way, the angry passenger found an important looking, uniformed young man, who was majestically pacing to and fro on the upper deck. His trousers were freshly pressed and the setting sun was brilliantly reflected in his shining brass buttons and gold bands.

"Hey, what kind of a skin-game do you call this, anyway?" caustically snarled the under-sized stranger, planting himself squarely in front of the promenading officer.

"Er—what's that?" spluttered the surprised knight of the uniform, halting involuntarily.

"Huh! You're a bunch of dirty, cheating, lying, rotten fakirs, and you know it!" stormed the passenger, hotly, as he shook an excited fist under the nose of the astonished listener. "When I bought my ticket for this boat, I asked the agents why she didn't come up to Portland to take on her passengers, and the skunks told me that she was nearly a quarter of a mile long and had to stay down the river where there was room enough for her to turn around in! And they said that she had three captains and five smokestacks and six decks and a big brass band on every deck!"

"But—!"

"Where's the three dining saloons and the moving picture show? Where's the swimming pool and the ballroom. Where's—!"

"Well, what are you tellin' me all about it fer?" sharply interjected his listener. "I didn't sell you your ticket, did I?"

"No, but you're the captain of this steamship, aren't you?" snapped the buncoid one, glaring at the officer's glittering gold buttons.

"No, I'm the chief radio operator," announced Peter Bockstrup, with dignity, drawing himself up to his full height.

"Piffle!" snorted the disagreeable stranger, and he went away.

Feeling a good deal irritated because of this affront, Peter Bockstrup started toward the wireless room. Upon going to it, he found another passenger standing in the doorway and looking in at the radio equipment. He was a tall, well-built man, with a rather hard, yet not unattractive face, which was slightly disfigured by a small birthmark on the left cheek.

"Pardon me," he said, easily, stepping aside as the chief wireless operator approached, "I was just taking the liberty of glancing in at your apparatus."

"Oh, that's all right," answered Peter Bockstrup, unconsciously contrasting the man's agreeable and somewhat distinctive manner with the nervous and snarling disposition of the small stranger whom he had just encountered. "Come in an' sit down awhile if you want to."

"I will, thanks," responded the passenger, with alacrity, stepping inside. "There doesn't seem to be any place for one to go and while away the time on this steamer—her passenger accommodations are hardly to be called attractive, to my notion."

"Yep, that's right," agreed the chief wireless operator, proffering a broken-down chair to his visitor. "In fact, this scow's so darned cramped up a fellow can't hardly get out of his bunk in the mornin' without fallin' overboard."

The stranger laughed, appreciatively, and thus the ice was broken. Peter Bockstrup found the passenger, who said his name was Collinge, to be a pleasing talker. He gave an impression of having traveled extensively and seen much, his observations were interesting and he conversed freely on many subjects, yet, when talking directly about himself, he exhibited a peculiar reserve, which the chief wireless operator could not understand.

It was almost midnight when Collinge left the wireless cabin and went to his stateroom.

Shortly afterward, the "Yosemite" slowed down abreast of Astoria and the river pilot was taken off by his launch. Two hours later, the little steam-schooner crossed out over the bar and set her course for San Francisco.

When Peter Bockstrup arose at six o'clock in the morning to relieve his second operator, he found the ship bucking into a strong, southwesterly gale. A sixty-mile wind had whipped the ocean into long lines of high, white-capped seas, among which the old steam-schooner was rolling and pitching violently. Going into the radio room, Peter Bockstrup discovered his assistant seated

in the middle of the floor, clasping a fire-bucket firmly between his knees, into which he was involuntarily ejecting food-stuffs at frequent intervals. Even the chief wireless operator, seasoned veteran that he was, with four months of sea service to his credit, had a rather uneasy feeling in the pit of his stomach.

The gale increased in fury. The "Yosemite" began to ship seas, which shook her from stem to stern; and which sent clouds of salt spray flying along her decks. Peter Bockstrup thought of the disagreeable stranger who had so rudely accosted him the evening before, and the chief wireless operator laughed to himself as he mentally pictured the unhappy passenger being tossed around in his uncomfortable bunk. Peter Bockstrup did not have any doubt but that the fellow was thoroughly seasick, and, therefore, he was greatly astonished when the wireless room door was suddenly jerked open and the very object of his thoughts squeezed inside. He was dripping with water, having evidently been drenched while clambering up to the upper deck upon which the radio shack was located. In one hand he tightly gripped the small black satchel which he had brought aboard with him, and his face was an ashen gray.

"There's a dangerous crook on board this ship, and I want to send a message to the police!" he burst out, shivering as though with an ague, and the cringing, terrified manner in which he spoke was in remarkable contrast to his caustic, snappy style of the evening before. "He doesn't know that I'm carrying this—" he indicated the satchel in his hand, "—and if he should find out about it, he'd surly do away with me and steal it!"

"Steal what?" queried Peter Bockstrup, puzzled.

"I'm a special messenger of the De Lacey Detective Service," answered the passenger, nervously glancing over his shoulder, "and I'm carrying a package of jewelry from the Ellingsworth vaults in Portland to Mrs. Ellingsworth in San Francisco. She expects to wear the jewelry at some reception affair next week—but she never will though, if Lone Lambert discovers that I have it here with me!"

"Lone Lambert!" broke in the chief wireless operator, interrogatively.

"He's a big man with a small birthmark on the left side of his face," said the queer passenger, with another nervous shiver. "He looks and acts somewhat like a gentleman traveler, but he's only a desperate crook, however."

"Birthmark! You mean Mr. Collinge!" ejaculated Peter Bockstrup, incredulously. "You're out of your head, I reckon."

"No, I'm sure he's Lone Lambert," whined the other. "I saw him once quite a while ago when he was running an oil-stock swindle and some other fake promotion schemes. Things got too hot for him in that line, as it was discovered that he had a record for clever robberies and crookedness as far back as they could trace him. He's wanted by the police of a dozen cities."

"Well, you might be right, but I reckon you're all wrong, because only rubes an' hicks get fooled into comin'

aboard this five-smokestacker," affirmed Peter Bockstrup, with a faint smile. "And, anyway, if the jewelry stuff's worth so much, why didn't you send it by express?"

"That's none of your business," snapped the passenger, smarting under the implied sarcasm and forgetting his fright in his rising anger, "I came here to send a message—not to argue with you!"

"All right, all right," hastily answered Peter Bockstrup, and he handed the passenger a pad of sending blanks.

The passenger took a note-book from his coat pocket, and consulting it frequently, he wrote out a message, composed entirely of code words.

"It's to a private address," said the chief wireless operator, looking at it.

"That's a special police address," responded the messenger, shortly.

Peter Bockstrup checked the telegram.

"Forty words," he said. "That'll be six dollars and fifteen cents to Frisco."

The passenger paid the charges and went out.

The chief wireless operator called up the naval station at North Head and sent the message. He had just finished when Collinge rapped on the door and came in.

"Was that sneaky-looking little fellow in here a few minutes ago filing a telegram?" he asked, sharply, motioning toward the pad laying on the operator's desk.

"Er—yes," answered Peter Bockstrup, with some hesitation, "but I can't tell you nothin' about it—it would be against the law." He prudently covered the pad with his hand.

"Oh, that's all right, you don't need to—the mere fact that he did send a message tells me all I wish to know," replied Collinge, with a strange, hard smile. "I'd wager a hundred dollars to a dozen Russian rubles that he's got stolen goods in his possession again."

"Stolen goods!" ejaculated Peter Bockstrup, astonished. "Isn't he a special messenger, then?"

Collinge laughed, shortly.

"Did he tell you that?"

"Yes, he did," blurted out the chief wireless operator, half involuntarily. "And he said he was takin' a bunch of jewelry to Frisco for a woman to wear at a party next week!"

"Humph! That's a good one," Collinge chuckled, grimly. "Lone Lambert a special messenger. Ha ha!"

Peter Bockstrup's eyes opened wide with amazement.

"You say his name's Lone Lambert?"

"Yes, why?"

"But—er—gosh!" spluttered the astounded chief wireless operator. "That's who he said you was!"

"Well, I'll be damned!" exploded Collinge, and he laughed, heartily. Then he drew back the lapel of his coat, revealing a Pinkerton detective badge.

"You're a detective!" gasped Peter Bockstrup.

Collinge smiled.

"Supposed to be one," he replied.

"Yet, I really didn't even know that Lone Lambert was on board until I happened to see him duck into his stateroom a few minutes ago."

There was a pause.

"As I was intending to say before, you shouldn't have sent that telegram," Collinge continued, "but, of course, it's too late, now. Give me the pad and I'll write out one for headquarters, so that they'll be ready for us when we dock at San Francisco."

Peter Bockstrup handed the message pad to Collinge. Like the nervous passenger before him, he took out a note-book and consulted it to obtain code words, which he wrote down on the blank. The chief wireless operator observed that Collinge's telegram was also to a private address. He started his motor-generator, got hold of the station at North Head again, and sent the message. Collinge stayed in

was blowing with such fury that he was obliged to cling to the deck railing in order to keep his feet. He looked up at the ship's masts and saw that his aerial had entirely disappeared. Even the lead-in wires had broken off, near the roof insulator, and were gone.

As he stood clutching the iron railing with both hands and staring up at the bare sticks, he became aware of the fact that Collinge was at his side.

"It's darned queer that your whole antenna went overboard at once," he shouted, his voice almost drowned by the roar of wind and water. "Let's go and look at the halyards."

Holding onto anything offering a hand hold, the chief wireless operator and Collinge made their way to the main-mast shrouds. There they found the manila aerial halyard still fast in the rigging, with a short piece hanging down. Collinge seized the end of the rope and examined it.

"Look!" he shouted, showing it to his companion. Peter Bockstrup looked and saw at a glance that the rope had been severed with a sharp knife. Waiting until there was a slight lull in the storm, the two investigators hurried over the lumber deck-load to the fore-mast riggin. The fore aerial halyard was found to have, apparently, been cut half through, and to have then broken.

"What do you know about that for slick work!" exclaimed Collinge, sharply. "He cut this forward halyard almost in two, so it was barely holding, and then he went aft and cut the other one away altogether and thus sent the whole thing flying over the side!"

"You mean that Lone Lambert done it?" queried Peter Bockstrup, dismayed.

"Of course he did it," answered Collinge. "It was easy, as there's nobody on deck in this weather. The man at the wheel has his hands full trying to keep the old tub somewhere near her course, and the mate on watch seems to be staying inside. Lambert could easily have done this without anybody's noticing."

"Yep, I reckon that's right," assented Peter Bockstrup, gloomily, and the pair clambered back aft over the deck-load.

"Is there any way to mend it?" queried Collinge, in a worried tone, when they were back in the wireless room.

"No, not just now anyway," answered the chief wireless operator, dejectedly. "Nobody can get up to where the aerial halyard blocks are an' reeve new ropes in this storm. Anyhow, I haven't got no aerial wire or insulators or anythin'. I'd like to know what that ornery plug went an' cut the aerial away for, in the first place."

"That's easy to explain," responded Collinge promptly. "He simply fears that the police have followed his trail to where he boarded this boat and he knows that if this should happen to be the case, the captain would soon get a message ordering his arrest."

(Continued on page 219)



"Keep quiet, Jack Lambert," he grated, in a steely tone, drawing a big automatic from his coat pocket."

the wireless room until Peter Bockstrup had signed off, and then he went out.

About fifteen minutes later, just as an unusually violent wind-squall struck the "Yosemite," causing her to pitch and lunge more wildly than ever before, the chief wireless operator heard the beckoning whistle of the speaking-tube connecting the radio cabin with the ship's bridge.

"Hello there," he answered, taking the tube off its hook.

"Say, Sparks"—it was the captain's voice, barely audible above the howling of the storm—"your wireless gear bane gone overboard! It carried away, fore an' aft, both together at vunce an' vent all over the side! You bane come out an' have a look, quick!"

"All right," answered the chief wireless operator, and he made for the door. With difficulty, he forced it open against the wind, and went outside. The gale

DOWN TO THE MINUTE

UP TO THE STANDARD

RADIO COMPASS SYSTEM IS A SUCCESS

AFTER a test extending over two months the radio compass control for shipping entering Golden Gate has been brought almost to perfection, according to reports by the naval authorities in charge of the system. The eight stations established around the entrance to San Francisco harbor are all in excellent working order and two more have been added to the San Diego district.

Although the masters of vessels entering this harbor have been slow in taking advantage of the new service, which began on September 15th, the records show that 342 vessels have received their bearings from the land stations and the central location at the Farallones, during October. It is expected every ship approaching the Golden Gate in foggy weather will make use of the free service furnished by the Navy Department in the near future.

Despite the difficulty experienced in obtaining a sufficient number of operators to take charge of the stations at the start, the navy has now a highly trained corps ready to give accurate information to mariners. The greatest variation recorded in the compass readings since the stations were established was only two miles. These discrepancies were made at the beginning of the new system when captains of vessels were not familiar with the methods of determining positions by means of the wireless compass stations.

The Dutch steamer Moerdyk was saved several hours recently by the use of the compass control. The vessel had decided to anchor two miles off the South Side Life Saving Station to await the lifting of the fog. When the captain received a message from one of the stations offering to give the location of the ship he was enabled to make port without anchoring.

The radio compass stations are in charge of Lieutenant Commander S. D. McCaughey, and are located at Point Reyes, Bird Island, Farallones, Point Montara, Point Arguello, Point Hueneme, Point Fermin and Eureka.—San Francisco "Call."

ARMY CALLS FOR RADIO OPERATORS

Thirty expert radio and telegraph operators are wanted by the Signal Corps, U. S. Army, for duty on the Washington-Alaska cable and telegraph system, according to an announcement received at Camp Lewis from the office of the chief signal officer, Washington, D. C.

Enlistments are wanted at once, the

announcement says, and the men will be sent to the 8th Service Company, Presidio, San Francisco, for basic military training, instruction in office management, money transfer papers and duties necessary to the proper performance of duty on the Alaskan system. From there they will be sent to Fort Lawton, Wash., for assignment to an Alaskan station in the spring.

Only first-class radio and telegraph operators with commercial experience will be considered, it is stated.—*Tacoma "Ledger."*

"WEARING OF GREEN" ANGERS GREAT SNAKE
Efforts of Wireless Operator to Soothe Reptile Drive Him Overboard

THAT vessels with cargoes of wild animals should not put to sea unless equipped with a wide assortment of music was demonstrated aboard the British freighter Bolton Castle, which arrived at New York recently from China with the story of an unsuccessful attempt to soothe a huge boa constrictor with the music of a phonograph inadequately supplied with appropriate records.

The snake, said to have been thirty-five feet long, broke from a crate in the ship and after knocking the helmsman away from the wheel, wove its body in and out among the spokes, throwing the ship off its course and alarming officers and crew.

The wireless operator sought to pacify the serpent with music, and rushing to his cabin he returned with a talking machine and a record which he mistook in the dark for "Hindustan." The record turned out to be "The Wearing of the Green," and the music of snakeless Ireland served only to aggravate instead of calm the snake. Spurred on by the blows of axes and revolver bullets, the reptile finally plunged over the side of the ship and disappeared.

It is declared that the wireless man has not yet lost faith in music as a medium for taming wild animals, but insists that before he ships with another cargo of snakes he is going to lay in an assortment of talking machine records of real snake music.—*New York "Globe."*

RADIO OUTFIT RECOMMENDED FOR SEATTLE HARBOR

ADOPTION of a plan whereby the Seattle Harbor Department would be equipped with one of the most powerful radio apparatus on the Pacific Coast, capable of transmitting and receiving messages a distance of 2,500 miles, was

recommended to the Council finance committee at its session recently by Fred M. Lathe, port warden.

The Harbor Department now operates a radio apparatus supposed to reach points within a radius of 500 miles of Seattle, but as a matter of fact effective for considerably less than half that distance, according to Lathe. Messages are exchanged with incoming and outgoing vessels, the plant being in charge of four wireless operators employed by the city. The service is valuable not only to the Harbor Department, but to shipping interests, as several shipping men testified at the committee meeting.

Under a recent order by the federal radio inspector for this district the Harbor Department's wireless plant will be required to accept all commercial business that may be tendered in the future. This makes necessary installation of more powerful apparatus, harbor officials declare. In an offer transmitted to the Council finance committee recently by the port warden, the Independent Wireless Company agrees to install an up-to-date instrument guaranteed to have an effective radius of 2,500 miles if the city will furnish the operators and maintain the service, the city to divide the gross revenue of the business on a fifty-fifty basis.—*Seattle "Times."*

PRESS USE OF UNITED STATES RADIO ASKED

Washington, Dec. 22.—(By Universal Service.)—Press associations and metropolitan newspapers asked Congress to open naval wireless stations for transmission of news to and from Europe under a contract system which will enable them to effect a definite arrangement that will afford relief from the present deplorable lack of facilities.

Testimony of representatives of these organizations before the House Merchant Marine Committee disclosed the utter inability of privately owned cable and radio companies to handle press matter within a reasonable time.

The companies have all the commercial business they can handle, it was conceded by spokesmen for the Radio Corporation of America and the International Radio Company and they are unable to facilitate transmission of news. Conclusive proof was submitted that press dispatches are frequently delayed from eight to twenty-eight hours in reaching the United States, which makes them practically valueless.—*San Francisco "Examiner."*

Turn to page 203 and give the special offer your best consideration before you lay this issue aside.

"GRID BIAS" AND THE GRID-LEAK CONDENSER

By H. Tenny

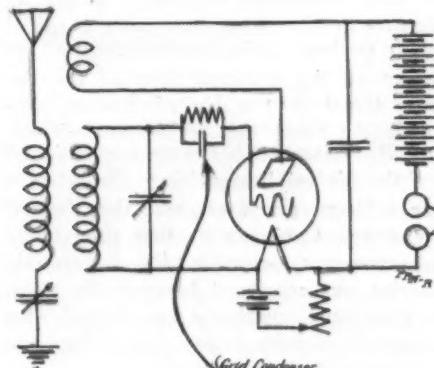
(If you use a vacuum tube you will need to read Mr. Tenny's article carefully, and use this method of providing a negative potential on the grid with respect to the filament, thus eliminating the grid leak and condenser.—Editor.)

AS the subject of a great deal of propaganda of late, the grid condenser, and its running mate, the grid leak, have become to the average amateur and experimenter a nearly indispensable adjunct to the already overburdened receiving circuit using the vacuum tube.

The successful elimination of these familiar stand-bys has been accomplished in a simple manner in the latest and most practical circuits developed and adopted for government use. This is done by arranging the grid-filament secondary circuit in such a way as to cause a definite and constant difference of potential between the grid and the filament.

Figures 1 and 2, with attendant notes, illustrate the principle. The adjustment of the grid connection, as shown, introduces this bias. The negative potential is determined by the point along the filament rheostat at which the grid circuit terminal is connected. In the present practice the adjustment is usually made to effect about a 15 volt bias, which is correct for most receiving tubes now in use, but for the experimenter it would be advisable to make this variable in order to permit quantitative observations being taken.

From experiments and tests by the author the following conclusions were obtained with regard to the new system:



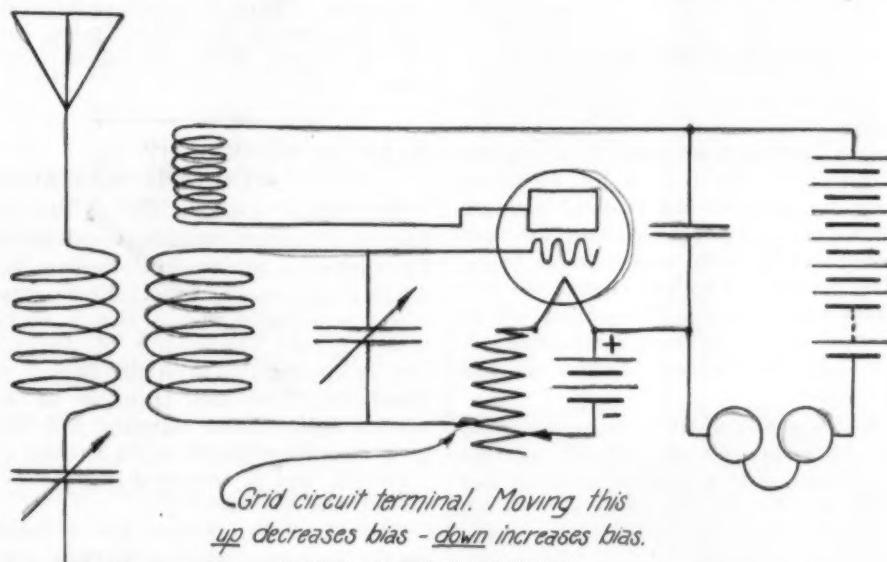
OLD CIRCUIT
Figure 1

Grid-Leak and Condenser

1. Condenser requires adjustment for different wavelengths.
2. Using leak weakens signals to greater or less extent.
3. Leak damps oscillations.
4. When not using leak, signals loud but bulb "squawks" at critical adjustment.
5. Unless receiver is shielded, capacity is caused by movement of the hands and nearby conducting bodies.
6. Grid condenser and leak involves two additional pieces of apparatus and panel space for same.

Grid Biased

1. No adjustment required.
2. Signals amplified by proper bias voltage.
3. Bias facilitates oscillations.
4. Signals with bias always loud and bulb never "squawks" at any adjustment.
5. Capacity effect is prevented whether shielded or not.
6. Bias is accomplished by slight change in the wiring, without any additional apparatus.



NEW CIRCUIT

Figure 2.

ANOTHER HONOLULU TEST IN FEBRUARY

A RECENT communication received from Mr. M. A. Mulroney, expert radio aide at the U. S. Naval Radio Station, Pearl Harbor, T. H., states that arrangements are being made for conducting another Hawaiian transmitting test on the nights of February 5 and 6, 1921. The time for the tests has been set at

6:45 p. m. Honolulu time, running over a period of twenty minutes on both occasions. When it is 6:45 p. m. in Honolulu it is 9:15 p. m. in San Francisco. Mr. Mulroney states that it is his desire to limit the number of contestants to four per night, allowing a testing period of five minutes to each contestant. A

short message will be transmitted, copies of which will be mailed to the contestants from this office. Applications from prospective contestants should be sent to the office of the "Pacific Radio News" promptly and we will proceed to make telegraphic arrangements with Mr. Mulroney.

NEW PHONE SERVICE ANNOUNCED

Announcement was made recently at headquarters of the Twelfth Naval District that conversation by telephone with aviators in the air, or ships at sea, will become a reality within a few weeks

through a wireless extension of the naval radio apparatus now being installed at South San Francisco.

San Franciscans will be able to ask long distance to connect them with "Captain So-and-So," en route to Reno by

air, or with "Friend Wife," due here on a steamer. And they will get the connection and talk with the party desired as they would with someone in some other part of the city.—San Francisco "Recorder."

NEW STATIONS OF THE FEDERAL TEL. CO.

(By Haraden Pratt, Acting Chief Engineer of Federal Telegraph Co.)

PRIOR to the world war, the Federal Telegraph Company, having its factory in Palo Alto, operated a chain of radio stations giving communication between all the principal cities of the Pacific Coast in the United States. Immediately upon the declaration of war in 1917 these stations were requisitioned by the United States Navy Department for military purposes, and the Federal Telegraph Company at that time made arrangements whereby its telegraphic service was continued between the cities in question through the use of land wire telegraph circuits leased from telephone companies for the purpose.

During the course of the war the equipment of these various radio stations was purchased by the government and in several instances removed or altered for military purposes, so that at the close of the conflict the Federal Telegraph Company was not in a position to return to the use of radio for conducting its inter-city telegraph service.

The company has recently effected arrangements for the erection of the necessary radio stations to permit it to again utilize radio for conducting this coast-wise business, and active construction has commenced on the first two units of this work, namely, the erection of two radio transmitting stations, one located near Portland, Ore., and one located near San Francisco.

Facilities Improved Since War

The engineering department of the company is taking advantage of this opportunity by erecting radio stations which will contain equipment capable of rendering far better service and handling a much larger volume of commercial traffic than was possible with the facilities in use prior to the war. The stations are first-class and modern in every respect, and are being equipped with Federal arc radio transmitters of the most modern design.

The most conspicuous and predominating physical feature of these stations consists in a 626-foot guyed steel tower of new and novel design and presenting several interesting features from an engineering standpoint. This tower consists of a latticed steel shaft six feet by six feet square, rising perpendicularly from a ball and socket joint at the ground, upon which it rests. Five sets of steel cables attached to massive concrete anchors are used for supporting this structure in a vertical position.

An umbrella type of antenna system having a diameter of approximately 3,000 feet is utilized for generating the neces-

sary waves to be used for the transmission of radio signals. This antenna system has its center supported on the top of the 626-foot tower, just described.

The station near Portland is being erected on a tract of land bordering the Tualatin River, near the town of Hillsboro, Washington County, at a point approximately eighteen miles from the city of Portland. Radio operators located in the company's offices in the heart of the business district of Portland will control two radio transmitters located in this station. This method of control will enable messages to be transmitted from the station at the same time that messages are being received in Portland, thereby providing facilities for quadruplex operation, since there will be two receivers and two transmitters capable of simultaneous use.

Palo Alto Station Being Built

The station nearest San Francisco is being erected on a tract of salt water marsh land east of Palo Alto. Special construction at this place will be necessary for securing the required strength of foundations for supporting the steel tower and the radio station power house. The operators who will control the two radio transmitters in this station will be located in the company's telegraph offices in the business district of San Francisco.

The completion of these two stations in the early part of 1921 will see the inauguration of a reliable, efficient and high speed quadruplex radio telegraph service between the cities of San Francisco and Portland.

The Federal Telegraph Company, prior to and during the period of the war, built and installed a large number of radio equipments for the following radio stations: Radio, Va.; Darien, C. Z.; San Diego, Calif.; San Francisco, Calif.; Pearl Harbor, T. H.; Heeia, T. H.; Guam; Cavite, P. I.; Cayey, Porto Rico; Sayville, Long Island, and Annapolis, Md., the latter being a 500 k. w. plant. There has just been completed and passed into operation the largest radio station in the world, equipped with Federal arc radio apparatus in duplicate of 1,000 k. w. at the Lafayette radio station, near Bordeaux, France. This company is also manufacturing 300-2-k. w. radio transmitters for installation on vessels of the United States Shipping Board. A large number of these vessels have already been equipped. In addition to these, a number of 2-k. w. Federal arc radio transmitters are being used by the United States Postoffice De-

partment in connection with the trans-continental air mail service.

BOOK REVIEW

Federal Arc Radio Transmitters. Manual for Radio Operators. Part 1 and Part 2. Published by the Federal Telegraph Company of San Francisco. First Edition, 1920. Part 1 contains information on General Principles of Radio Communication as applied to Arc Radio Transmitters. Part 2 is a description and instructions for the care and use of 2 KW Federal Arc Radio Transmitters, Models "K," "Q" and "X" and the 5 KW Federal Arc Radio Transmitter Type CT-1201 for ships and small land stations. The Manual contains 37 illustrations and half-tones of arc transmitters, circuits, maps and hints on arc operation. Price, \$2.50 per copy, postpaid anywhere in the United States. For sale by Pacific Radio Publishing Company.

PLAN TO MARKET BY WIRELESS MESSAGES

San Diego ranchers are to be informed of market conditions and prices by means of government wireless, according to report from Washington, where it is stated such a plan is to be tested by the Department of Agriculture in co-operation with the Bureau of Standards. The experiment is to be tried in half a dozen Maryland and Virginia counties adjacent to the District of Columbia, and if successful will be extended over the country.

The plans contemplate the eventual use of seventeen wireless stations over the country. The wireless news of market conditions and prices will be sent broadcast, and arrangements will be made with numerous private licensed operators who would aid in distributing the reports to farmers and others interested in the territory covered.—San Diego "Tribune."

The address of the station operated by A. E. Ekdale (6ACY) is 115 North Chester Avenue, Pasadena, Cal., instead of Los Angeles, Cal., per our January call list.

STATION LICENSE SUSPENDED

The station license of L. J. Reidman, 61F, 83 N. Euclid Ave., Long Beach, Calif., has been suspended for ninety days. Reidman was found guilty of operating a station on an excessively broad wave, and causing interference with commercial and naval business.

Arc Radio Apparatus

By Jennings B. Dow

Published by Permission of the Secretary of the Navy

PART VI

In as much as ordinary microphones are incapable of handling more than 0.2 or 0.3 ampere at the most at a voltage of about 20, several microphones in series must be used to handle anything but the smallest fraction of an ordinary arc's output. Twelve telephone transmitters mounted upon the concave side of a wooden bowl (the kind used for culinary purposes will serve the purpose admirably) have been used with considerable success. Such an arrangement will modulate about 36 watts of antenna energy which should make possible reliable radiophone communication over a range of about twenty miles, and with good amplification at the receiving station, no difficulty should be experienced in increasing this range to forty miles.

A form of microphone with which the author has had some success as far back as 1913 was constructed as follows: Two concentric brass tubes about six inches in length, the larger one having an inside diameter of one inch and the smaller one an outside diameter of $\frac{7}{8}$ inch were arranged vertically. The larger one had a hopper at its upper end into which iron filings could be placed, and the smaller one was closed at both ends and fitted up for water circulation. A winding of six layers of No. 28 DCC magnet wire was wound upon the outside tube and this coil was placed in the plate circuit of two small De Forrest vacuum tubes (Type S). The grid circuit was controlled with an ordinary telephone transmitter. The current variations in the plate circuit resulting from the telephone control of the grid circuit altered the magnitude and intensity of the magnetic field between the tubes. As the iron filings passed between the tubes, their flow was regulated by the field, and the resistance of the path between the two electrodes (tubes) which were connected across the antenna inductance was varied over a considerable range. This device had a resistance of approximately 10 ohms when 100 milliamperes were flowing in the field coil of the device, and this resistance in-

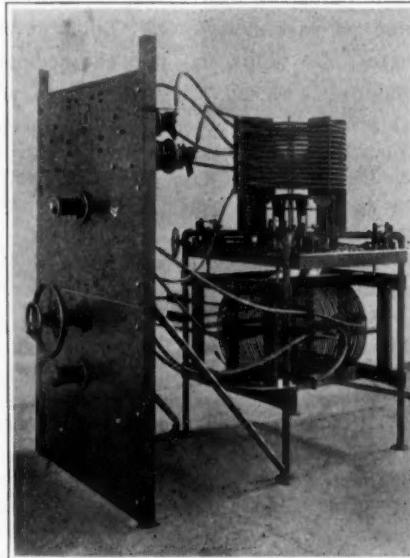


Fig. 3-A

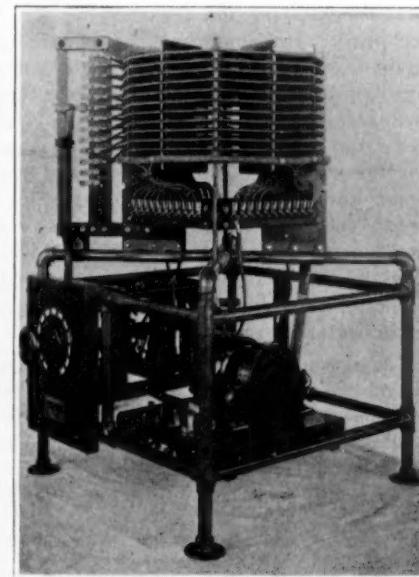


Fig. 4-A

Description of wave Changer and Inductance System for Federal Telegraph Co. 20 K. W. Arc Transmitter Fig. 3-A.

Upon the panels are mounted the wave changer switch and switch for controlling the magnetic field of the arc during the starting period. The two hand wheels operate the switch arms by means of a chain and sprocket arrangement. Note the large pedestal insulators which support the switch points for the high potential end of the loading inductance. The lower inductance is wound with bare stranded copper cable, and is used for the finer adjustments of wavelengths. It is inserted in the circuit between the arc and the loading coils which are mounted above. These loading coils are wound with a special "Litz", well insulated.

The key system for this particular apparatus is of a type commonly found in the large high power installations. It may be seen just below the loading coils, and consists of a spiral winding of heavy "Litz" inductively coupled to the loading coils, and may be short-circuited by the heavy duty relays mounted at the corners of the frame-work.

Description of Wave Changer and Inductance System for Federal Telegraph Co. 5 K. W. Arc Transmitter, Fig. 4-A.

The wave changer switch may be seen to the left and the leads to it are made from the taps brought out from the loading inductance above. There are three switch arms; the one nearest the control handle regulates the larger divisions of inductance; the middle one, the power absorbing resistance, and the third one, the smaller divisions of loading inductance. To the right of the wave changer is the interrupter or chopper which makes possible the transmission of wave trains whose reception is possible without heterodyning the received signal. It is simply a motor driven commutator which intermittently shorts circuits the single loop of heavy Litz around the lower section of the loading inductance. Several other connections for this device are possible but it operates most satisfactorily here.

creased to approximately 80 ohms with zero current. Because of these characteristics and the water cooled electrode, it was possible to control 400 watts of antenna energy which was, at that time, considerably more energy than was ever

controlled by a dry microphone previous to it. The arc quenching feature of the magnetic field also entered into the success of the device, for, without it, disagreeable arcing took place.

(Continued on page 224)

CRITICISING THE DEP'T. OF COMMERCE—UNJUSTLY

(By Arthur H. Lynch)

COMMERCIAL radio men have the peculiar faculty, if it may be so termed, of talking "shop" just about every time they meet. At times it is tiresome, but for the most part it is very instructive and keeps them pretty well aware of what is going on throughout the art.

Sometimes they visit with each other while in the same port and run over old times. In theaters and other places of amusement they come across each other, and even though not acquainted, may have a great deal in common.

Two or three fellows get together in a foreign port and start off for a good time, and before they have gone very far they are met by several others who join them. Perhaps they wander along to the veranda of one of the cafes overlooking the public square in Tampico to hear a good band concert and partake of a little liquid cheer, or they find comfortable tables on the roof of the Plaza Hotel in Havana.

One thing is certain when such a gathering takes place. No matter how much good comes out of the conversation, you may bet your bottom bread-getter that someone is in for a severe and often well-deserved tearing up of the back. Not that the fellows do not do the same tearing when the individuals under consideration are encountered. There are but few who have not the courage of their convictions.

It was at one of these impromptu conventions that the following "razzing" was meted out to the Radio Service of the Department of Commerce. From the standpoint of the radio officer, there are many things wherein the department has seemingly fallen down, but in this particular instance it was slammed unjustly and the object of this article will have been gained if, when the "razz" is being given, the "razzer" is sure of his subject.

A short time ago a very heated discussion was heard, wherein the old-time radio man, who really should have known better, got up before some other radio men and forthwith outlined his views regarding the Radio Service of the Department of Commerce.

These are not his exact words, but an accurate account of the thought expressed.

"Just how is it that every other department on a ship goes to sea entirely equipped with all the information necessary for the carrying on of its work, while the radio officer has to get along as well as he can by trusting to good fortune or past experience? Look at the mates! On sailing day they come aboard equipped with all kinds of charts and tables and every other kind of information which they receive for nothing from the Department of Commerce. What do the radio officers get? Nothing, with a capital 'N'!"

These remarks met with little interruption, and he proceeded,

"Why, we don't even have a list of ship and shore stations, and it is next to impossible to worm out any information in the form of rate sheets. We are supposed to have a Berne List aboard, with all the supplements, but did you ever see one on any of the ships you have been on?" Of course, very few had seen them.

"If the Department of Commerce would instruct the radio inspectors to see to these things it would be a whole lot better for us. It doesn't seem fair to supply one of the ship's departments with all the necessary information and supply another department with none. It is up to us to bring this matter to the attention of the department and get all that is necessary for the carrying on of our work. Just imagine what you are up against when the ship is going to some foreign port which you have never visited before and the 'Old Man' sails into the radio room with a docking message for the ship's agent at the port and you don't know whether or not there is a coast station within leagues, and you most certainly are not acquainted with the land line charges, as there are no call books or rate sheets or any other source of information at your disposal.

"You are just about out of luck, and if you go calling CQ and ask some other steamer for the dope, the man you ask will probably be in about the same fix as you, and then you may expect a Svc from some other station telling you to QRX."

A Tip or Two

The fellow was given a chance to get through his little talk and was then wised up to some of the facts given here, which may be of value to some other men who are of the opinion that there are no sources of information on radio matters.

To begin with, a radio officer who sails without a copy of "Radio Communica-

tion Laws of the United States" is leaving himself open to attacks which he will have no means of combatting. This book may be had at any radio inspector's office. In addition to having a copy aboard, a fellow should have a great deal of the matter contained therein locked up in his memory. One item which seems to have been given very little consideration appears on page 56. It is Regulation 71 and says, in effect, that vessels in foreign or trans-oceanic trade shall have as part of their equipment a copy of the official Berne List and supplements thereto as issued.

Most of our vessels, engaged in such service, are under the supervision of the Shipping Board, and the board's radio supervisors will supply men with this list. Part of the radio inspector's duty is to see that the list is aboard, but because he does not always enforce this regulation is no reason for the ship being without the list. The radio inspectors have their own troubles.

One service of our government which seems to have been completely overlooked is the Hydrographic Office. Before sailing it is generally possible to find out what the itinerary is to be; the Master has to know it in order to get his charts. Find out where you are going and then go to the Hydrographic Office and secure the charts covering the section of the world you are going to visit. They will cost you nothing and they will indicate the location of the coast stations, and will furnish a great deal of information which will be of value and interest.

Another source of very valuable information is the complete book of regulations issue dby the Naval Communication Service. Published in loose leaf and accurately indexed and bound with a stiff cloth cover, this book is very handy to carry. It is not large and contains about all the information a fellow needs. It is issued without charge and may be found aboard ships formerly under navy control.

It is not a good policy for radio officers to buy necessary parts of their equipment, and even though there are times when such purchases would serve the individual well, the safest way is to do his best with what he is given. This is not as "tight" as a first thought might indicate. Everything necessary may be secured from the various sources of supply, and even though individual ships are given better service by certain activities on the part of the men, such as the installation of vacuum tubes, the craft in its entirety is better off without them until they are made standard units of

(Continued on page 226)

THE SPARK-TUBE TRANSMITTER

(By H. Tenny)

THE most recent experiment conducted by our foremost radio men was a series of tests for the compilation of data on a new type of radio transmitter, known as the "Spark-Tube" system. Comparison with other types of apparatus, including the Poulsen arc and the Navy quenched spark, showed a superiority for this system that was truly amazing, and more so when it is considered that the new system is as yet in its infancy of development.

Of more interest to the progressive amateur experimenter is the adaptability of the new transmitter to the solving of his present pressing problems of interference, etc. In addition to this, the system opens up a new field of investigation and individual progress, it being well known that the spark transmitter has been resolved down to pretty definite quantities, especially within the 200-meter limit, and the arc system is, of course, out of the question for short wave work.

Being based on the all-accomplishing vacuum tube as the generator of oscillations, it lends itself to ease of construction and operation by the use of high-voltage alternating current. The schematic diagram shown in Figure 1 will be easily understood by anyone familiar with vacuum-tube circuits. The transformer, used on the ordinary lighting circuit, eliminates all filament storage batteries and expensive motor-generator installations, besides delivering the usual high power efficiency and absolute dependability of such equipment.

The present undeveloped stage of this apparatus makes it desirable that the experimenter confine himself to a rather low power-range, and increasing same to substitute his present equipment as he becomes more familiar with the new problems involved. In this article, therefore, the writer will describe a novel "buzzer" set, operating on the Spark-Tube principle, small in cost and power consumption, yet showing in operation a range of transmission equal to many spark power-sets of many times its size.

To furnish the high-voltage plate current an ordinary spark coil will be used, with the secondary wound to the current-voltage requirements of the particular type of vacuum tube used. In this case the standard V. T. will be considered, and the coil constructed as follows:

Core: Laminated. $\frac{5}{8}$ inches diameter. 5 inches long:

Primary: Two layers No. 16 DCC magnet wire.

Secondary: Four pancakes, each $\frac{1}{2}$ inch thick, 800 turns each of No. 32 DCC or DSC magnet wire.

If the builder is inexperienced in the construction of spark coils he can consult any of the number of wireless manuals on the market which cover the subject quite a good deal better than could be done in the small space available here.

In this coil, however, the insulation of the secondary need not be such an item of consideration as in the usual radio coil, as the voltage generated will not be over 1,000 volts.

The vibrator can be constructed as desired, but a better way would be to obtain a regular Ford coil vibrator from a supply house. There are also a number of radio companies that put out satisfactory coil vibrators for a very slight expenditure.

In the first model of this set the writer used an old Ford coil complete, rewinding the secondary as described.

For purely experimental purposes the use of a panel for mounting the apparatus is hardly advisable. A better and more flexible arrangement is to mount the units on a dry, shellacked wooden base, about 24x36 inches in size. A smaller base will hold everything, but will be more inconvenient for the use of measuring instruments in tests, etc.

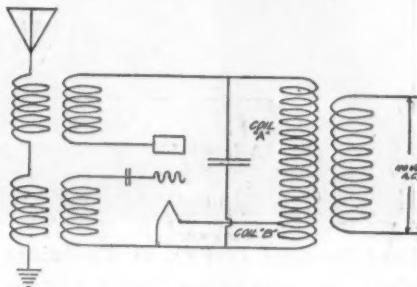


FIGURE 1
Schematic diagram of Spark-Tube Transmitter.

Coil A is the Plate Secondary.
Coil B is the Filament Secondary.

The rest of the units making up the complete set are standard pieces of amateur equipment. The two condensers should be of the .001 M. F. size, variable. The switch (d) in Figure 2 is an ordinary lighting snap switch. Connected as shown, it controls at once the plate and filament circuits, protecting the battery when the set is not in use.

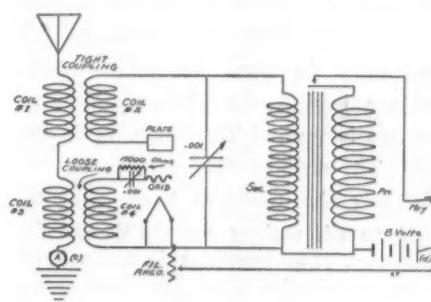


FIGURE 2
Schematic Diagram of Buzzer Spark-Tube Transmitter.

The Tight Coupling Coils should be wound as follows:

Coil No. 1—10 turns No. 22 DCC, 3-inch diameter.

Coil No. 2—10 turns No. 22 DCC, 3½-inch diameter.

Loose Coupling Coils:

Coil No. 3—5 turns No. 22 DCC, 3-inch diameter.

Coil No. 4—5 turns No. 22 DCC, 3½-inch diameter.

Note—In assembling, care should be taken to reverse the storage battery terminals if the set does not function properly. The usual vario-couplers on the market can be used in this circuit.

The only permanent indicating instrument necessary is the antenna-current ammeter (c) in Figure 2. This is to some extent expensive, but a good instrument can be used at every turn in the laboratory. A temporary substitute is a small flash-light bulb placed directly in the circuit. The glowing at full brilliancy of this light will indicate that the set is operating satisfactorily, but it must be remembered that the light itself will

consume a certain amount of power that would be saved by the use of a suitable ammeter.

The following readings were taken from the initial apparatus of this type, but they will vary with the different tubes and coils, grid leaks, etc., used:

Filament current: 0.9 amp.

Coil primary current: 4.2 amp.

Plate current (RMS) 0.022 amp.

Antenna current (200 meters): 0.43 amp.

Effective range transmission: 40 miles.

Coil primary voltage: 8.

Effective plate voltage: 620.

Frequency: About 400 breaks per second.

It will be noticed that, due to the intermittency of the plate voltage, the tube can be worked at about 25 per cent higher power capacity than with the usual DC used in vacuum tube work, without unusual deterioration of the filament.

The principal advantage of the oscillation circuit here used is the absence of a series condenser in the antenna circuit, and the convenience of tuning and adjustment of the plate and grid circuits. The wave length of the oscillations generated is the frequency of the antenna circuit, the other circuits being aperiodic, the inductances in them being used only for coupling them to the antenna circuit.

Tuning the transmitter is done practically the same as the usual Armstrong receiving circuit, adjusting the two couplers until maximum radiation is secured. The grid coupling, as a rule, should be loose and the plate coupling tight.

In future issues the author will describe a home-made arc of $\frac{1}{2}$ K. W. capacity, as well as some naval experiences in the QRM infested and static-splashing Far East.

UNIVERSITY WIRELESS WORKERS ORGANIZED

A Radio Club composed of twenty-five members was formed at the University of Washington at a meeting of men interested in this work. William Watson was elected president of the organization and A. C. Wright, secretary. California, Oregon Agricultural College, Montana and Stanford have wireless stations and receiving outfits.

Space in the electrical engineering laboratory on the campus, for the club and a new equipment will be installed at the expense of the university. Active work on the apparatus is expected to be started by April 1, 1921. As soon as the apparatus is ready, wireless service will be conducted among the various coast colleges in connection with the Pacific Intercollegiate Press Association, of which the University of Washington "Daily" is a member.

Fifteen of the twenty-five members of the club have had practical experience in wireless work, and will arrange to work in shifts to receive scores of all athletic games in the spring and fall.

RADIO CLUB NEWS

SAN FRANCISCO RADIO CLUB STARTS NEW YEAR RIGHT

AMONG the many resolutions made for the year 1921 by the San Francisco Radio Club the following are of interest.

- (1) Be it resolved, that every member of the organization do his utmost to secure new members for the organization.
- (2) Be it resolved, that a complete radio station be in operation within seven days from the date of this resolution.
- (3) Be it resolved, that the San Francisco Radio Club will stand out as the most progressive and efficient organization in the West.

To carry out these resolutions in rapid-fire time, the sum of \$200 was appropriated for the purchase of a complete short wave regenerative and a long wave honeycomb receiver. The radio telephone set is being thoroughly overhauled and a new aerial is being erected one the roof of the Gymnastic Building.

A net profit of over \$400 was declared from the proceeds of the recent wireless show.

Perhaps the most important step taken towards the promotion of the art among the members was the formation of a committee to arrange for the purchase of a large blackboard for use in illustrating new and novel radio hook-ups. One of these hook-ups will be illustrated and explained on every Tuesday evening and a copy of the proceedings will be sent to all club members.

A new membership campaign is now in progress. The dues remain at 50 cents per month, but the initiation fee is lowered from \$2.50 to \$1. No persons under the age of 16 will be admitted to the club. Meetings will hereafter be held on Thursday evenings instead of Tuesday evenings.

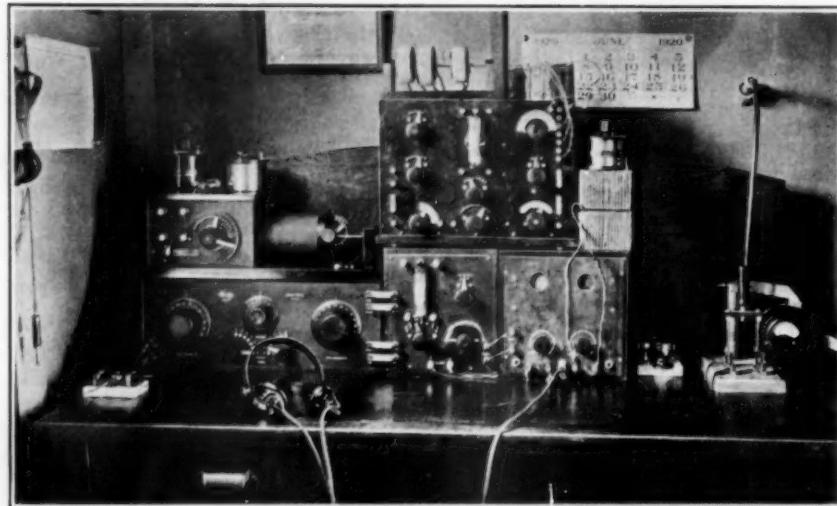
Mr. F. Barry has succeeded Mr. W. J. Henry as secretary. Mr. Henry has accepted a position as radio operator on one of the Panama boats.

All communications should be addressed to the secretary, 2460 Sutter Street, San Francisco.

THE MILWAUKEE AMATEURS' RADIO CLUB

THE Milwaukee Amateurs' Radio Club has started the present radio season with the idea of one big radio club for the city of Milwaukee and has absorbed the Wisconsin Radio League, of which mention was made in "Pacific Radio News" some time ago.

RADIO STATION 8WY



Lord Brothers (8WY), at Cambridge Springs, Pa., are to be highly complimented not only on their station, but on the clever idea of sending the photo shown above to many radio friends in the form of a calendar for the year 1921.

The lucky amateurs who are in receipt of the calendar can use it to ad-

vantage by keeping it constantly before their eyes as an inducement to rival the equipment used by the Lord Bros. and at the same time receive a free correspondence course in neatness applied to a radio set.

No comment on the apparatus used is necessary, as the photo is of such exceptional clearness.

The EDITOR'S MAIL BAG

Our Readers Are Invited to Send Contributions for Publication in this Department.

9LR, T. & H. Radio Co.,
Anthony, Kan., Dec. 29, 1920.
Pacific Radio News,
50 Main St., San Francisco, Cal.

Gentlemen:

I note in a recent issue of the "Pacific Radio News" that 9LR has been entered in the list of calls heard on the Coast, and I don't believe that a list of Western calls that we hear at Anthony will be out of place in your columns. They are as follows:

6AAT, 6EA, 6EN, 6ER, 6JD, 6KA, 6KP, 6JT, 6OT, 6ZA, 6ZM, 6ZH, 6IG, 6GE, 6WV, 6EJ, 7DA, 7CC, 7YS.

Of these, we have worked 6JD, 6KA, 6JT, 6ZH, 6IG, 6GE, 6WV, and have reports of our signals being received by nearly all of the rest.

We can copy the Los Angeles fellows nearly any time after midnight here.

Hoping the above will be of interest, we are,

Very truly yours,
T. & H. RADIO CO.

The amateur call letters, 6BM, were re-issued to Nathaniel R. Morgan, 223 Cowper St., Palo Alto, Cal.

The British Government will erect a powerful station at Hongkong for communicating with Hawaii.

Two In One, or a saving of 50 per cent, is what the special offer on page 203 means to you.

Advance Notice of a Near-Ham

(By Lawrence Mott)

(U. S. Deputy Fish and Game Warden,
Staff Correspondent New York "Sun,"
Sporting Correspondent Los Angeles
"Examiner")

HERE are no two—or three—ways about it! But one answer is there to the query: "To be—or not to be—a ham"?

Answer: to BE!

Hence the great Amateur Organization, for some hundreds o' miles about, will soon hear a new "note" in the night silences. And it will issue from my set, situated at Avalon, Santa Catalina Island, thirty miles out in the Pacific Ocean from the port of San Pedro, near Los Angeles. My call letters will appear in this publication in the next issue, as my sending set is being built to order, and is not quite finished, hence I cannot register its details, etc., and obtain a call and license from my good friend, Major Dillon, in time to catch this number.

But I am usually "listening-in" on short wave lengths from 9 to 10:30 in the evenings, and shall note any messages sent to me from them with whom I look forward to in the near future to having a most delightful dot-and-dash acquaintance.

Just here I give a short list of the further-away amateurs that come in QSA—now:

6AA, 6AB, 6AD, 6AE, 6AH, 6AI, 6AK, 6AN, 6AT, 6BJ, 6BM, 6BQ, 6BR, 6BY, 6AAK, 6CD, 6DK, 6DP, 6EJ, 6GF, 6GI, 6IG (and a lovely "note" he has, too!), 6IJ, 6JI, 6JM, 6KT, 6LM, 6MK, 6OT, 6SK, 6RT, 6RP, 6PK, 6TC, 6XZ, 6XD, 6UZ, 6WX, 6WE, 6UZ, 6UM, 6PK, 6PQ, 6WV, 6SL, 6TC, 6PR, 7AC, 7BQ, 7CU, 7DA, 7IE, 7ZJ.

Not at all a bad showing—considering that I have not got things **really** installed, as yet! Then I also get—QSA, WAG, VAG, VAE, VAJ, VAK, WWA, USF, WTB—and twice I have "got" NPM! Of course I hear NPG at any time, and I amuse me'sel', readin' his Honolulu press "dope" each night.

As it may interest prospective friends o' mine—within future reach—I briefly describe my apparatus—as it now stands. There will be some slight modifications when I install the transmitter.

A complete short wave, Grebe, regenerative receiver, with 2-step amplifier, and an exceedingly good detector-in-case that was made by a firm in San Francisco, whose name I have mislaid, but who will recognize my name, and realize my friendly intents to speak well of their apparatus! It uses an Audiotron tube, and is bulky.

Then I use Baldwin 'phones. My aerial consists in two spare, 70 feet and 35 feet, with four No. 14 soft-drawn copper wires. For my long-wave reception I use 280 feet of the same kind of wire. I shall increase this length, however, although I have been doing fairly well as it is.

The transmitter will consist of a vacuum tube set, using power bulbs to generate undamped waves, so arranged as to be able to use two or more bulbs, as required, and modulated by a buzzer for telegraphic work. The bulbs will be of the "hardest" kind I can get, and

(Continued on page 231)

SIXTH DISTRICT AMATEUR STATIONS—Continued.

CALL	NAME	ADDRESS	TOWN
6AHO	F. A. Seegert	423 West Islay Street	Santa Barbara, Calif.
6AHP	Geo. F. Coe	Route D, Box 114	Lodi, Calif.
6AHQ	Willie Williams	711 North Gordon Street	Pomona, Calif.
6AHR	R. A. Phillips		Moneta, Calif.
6AHS	S. Winters	659 Clayton Street	San Francisco, Calif.
6AHT	H. Iams	4460 Georgia Street	San Diego, Calif.
6AHU	W. Scammell	1033 Excelsior Avenue	Alameda, Calif.
6AHV	R. W. Goodale	703 So. Los Angeles Street	Los Angeles, Calif.
6AHW	R. Kreyser	805 North Gordon Street	Pomona, Calif.
6AHX	C. H. Parker	398 Molino Avenue	Long Beach, Calif.
6AHY	J. Deering	130 North Aurora Street	Stockton, Calif.
6AHZ	R. Hall	1721 Beverly Place	Berkeley, Calif.
6AIA	J. Anestasi	Fountain Street	Monterey, Calif.
6AIB	G. W. Till	1129 Bella Vista Ave	Oakland, Cal.
6AIC	Chas. E. Taylor	1620 Appleton St	Long Beach, Cal.
6AID	F. E. Gilbert	4021 S. Harvard Blvd	Los Angeles, Cal.
6AIE	M. L. Bruener	763 Humboldt St	Santa Rosa, Cal.
6AIF	D. Culbert	12 Upper Lowell St	Lowell, Ariz.
6AIG	Lindley Winser	200 22nd St	Bakersfield, Cal.
6AIH	R. A. Moody	707A Santa Clara St	Ventura, Cal.
6AIJ	R. W. Koch	3324 East 14th St	Oakland, Cal.
6AIK	L. B. Hutchins	5 West State St	Redlands, Cal.
6AIL	W. Moore	130 East 36th St	Pasadena, Cal.
6AIM	B. Wentworth	R. F. D. 3, Mission Canyon	Santa Barbara, Cal.
6AIN	Thos. M. Sides	1333 East Ave	Selma, Cal.
6AIO	B. H. Caseboldt	Route A, Box 93	Escalon, Cal.
6AIP	J. Pasavento	804 "P" St	Sacramento, Cal.
6AIQ	J. Kremer	403 East B St	Ontario, Cal.
6AIR	R. H. Rodgers	4143 Pacific Ave	San Diego, Cal.
6AIS	W. McManus	335 Vine St	Glendale, Cal.
6AIT	U. J. Barbel		Metcalf, Ariz.
6AJC	L. J. Keller	1260 Jefferson St	Santa Clara, Cal.
6AJD	J. C. Flagg	210 East 10th St	Claremont, Cal.
6AJE	A. W. Rowe	5131 Monte Vista St	Los Angeles, Cal.
6AJF	G. George	R. F. D. 1	Santa Barbara, Cal.
6AJG	G. E. Robinson	512½ Main St	Roseville, Cal.
6AJH	D. W. Pabst		Sisson, Cal.
6AJI	L. B. Kennedy	Letterman Hosp., Presidio	San Francisco, Cal.
6AJK	C. Simpkins	215 Jefferson St	Napa, Cal.
6AJL	J. Kaufman	803 West Oak St	Stockton, Cal.
6AJM	D. L. Hersh	1031 South Manhattan Place	Los Angeles, Cal.
6AJN	L. Hewett	135 West Willow St	Stockton, Cal.
6AJO	C. D. Elfving	334 McHenry Ave	Modesto, Cal.
6AJP	Frank E. Jones	1822 Hearst Ave	Berkeley, Cal.
6AJQ	J. H. Doig	2133 Columbia St	San Diego, Cal.
6AJR	L. Picker		San Ysidro, Cal.
6AJT	W. S. Terriberry	676 Apgar St	Oakland, Cal.
6AJU	H. C. McQuarrie	1115 Taylor St	San Francisco, Cal.
6AJV	H. C. Crabtree	660 West Hadley St	Whittier, Cal.
6AJW	G. Bergstrom	616 30th St	Ogden, Utah.

PACIFIC COAST RADIO COMPASS STATIONS

The following listed U. S. Naval Radio Compass Stations on the Pacific Coast are either in full commission or will be in full 24-hour daily commission, as follows:

Station—	Call Letters	Latitude	Longitude	Official Commissioning Date
Eureka, Calif.	NPW	40-41-47	124-16-29	Nov. 1, 1920
Point Reyes, Calif.	NLG	38-02-31	122-59-30	Sept. 15, 1920
Bird Island, Calif.	NLD	37-49-24	122-32-14	Sept. 15, 1920
Point Montara, Calif.	NLH	37-32-12	122-31-14	Sept. 15, 1920
Farrallon Islands, Calif.	NPI	37-42-00	123-00-00	Sept. 15, 1920
Point Arguello, Calif.	NPK	34-34-35	120-38-48	Dec. 15, 1920
Point Hueneme, Calif.	NMD	34-08-40	119-12-30	Jan. 1, 1921
Point Fermin, Calif.	NPX	33-42-19	118-17-37	Jan. 1, 1921
Avalon, Calif.	NZL	33-20-39	118-18-57	March 1, 1921
Point Loma, Calif.	NPL	32-42-30	117-15-20	Feb. 1, 1921
Imperial Beach, Calif.	NPL	32-35-14	117-07-55	Feb. 1, 1921

CALLS HEARD BY WESTERN AMATEURS

CALLS HEARD BY 6EA (Additional)

Heard: 5ZJ, 6AAK, 6DY, 6GE, 6NH, 6OO, 6PE, 6WN, 6ZM, 7GQ, 7YA and 7ZJ.

Worked: 5ZA, 6AAW, 6ACA, 6FX, 6GO, 6IG, 6KL, 6OC, 6OT, 6PR, 6UM, 6ZH and 7DA.

P. S.—My "sigs" were reported heard

by 9WU (Ellendale, N. D.) on December 3rd.

HEARD BY 6EB

(5ZA), (6AAJ), 6AAK, 6AI, 6FH, 6FJ, 6GY, (6IC), 6IY-cw, (6KM), (6OT), 6UO, 6ZM, 7YA, (7ZI).

Anyone hearing 6EB please write.

CALLS HEARD AT 6FZ (Berkeley, Cal.)

6AK, 6BQ, 6CV, 6Dk, 6DP, 6EA, 6EJ, 6EN, 6ER, 6FE, 6FS, 6GN, 6GR, 6GY, 6HY, 6IB, 6IF, 6IL, 6JD, 6JM, 6KA, 6GI, 6KP, 6KQ, 6MA, 6MK, 6OH, 6PQ, 6SK, 6TU, 6UM, 6UO, 6XZ, 6AAB, 6AAT, 6AFU, 6AFY, 6AGP, 7CW, 7CU, 7GQ, 7IN, 7ZI.

STATIONS HEARD AT 6OL

6AE, 6AH, 6AJ, 6AK, 6AN, 6BJ, 6BQ, 6CO, 6CP, 6CV, (6DK), 6DP, (6EJ), 6EP, 6FE, 6FS, 6FX, 6GF, 6GN, 6IC, 6IG, 6JI, 6JN, 6JR, 6KM, 6LE, 6NE, 6OC, 6OH, 6PJ, 6PR, 6QM, (6SK), 6UM, 6XZ, 6ZA, 6ZB (day), 6ZE, 6ZH, 6ZK, 6AAK, 6AAT, 6AFY.

CALLS HEARD AT 6AS (San Francisco)

(6AK), 6ACA, 6BH, 6BQ, 6DP, 6EA, (6EJ), 6ER, 6FH, 6GI, (6IY), 6JM, 6JD, 6KA, 6KP, 6MK, 6OH, 6PE, (6QR), (6TU), (6IC), 6XZ, 6OT, 6ZA, 6ZN, (7DA), 7BQ, 7IN, 7ZI, (7ZJ). 7ZJ was heard without antenna or ground, using two-step amplifier. Signals strong. Stations in parenthesis were worked on $\frac{1}{2}$ K. W. transformer.

Station 6GF is located at 2318 Eye Street, Sacramento, Cal., instead of 3347 U Street, as previously published. The owner of station 6AGU in Oakland, Cal., is Mr. Lew Torrey. His name was listed as Toney in the call directory.

Station 6XM is now located at 507 Ulloa Street, San Francisco. The following calls are reported heard: 6AJ, 6AK, 6AV, 6AY, 6BQ, 6CK, 6CM, 6CQ, 6OV, 6DH, 6DP, 6EA, 6EJ, 6ER, 6FE, 6FS, 6FV, 6GF, 6GI, 6HB, (6IYC-w), 6IZ, 6JD, 6JI, 6JM, 6JQ, 6KA, 6KP, 6OH, 6OY, 6PE, 6PR, 6QK, 6QM, 6QR, 6SK, 6TC, 6ZA, 6AAM, 6AAT, 6ACA, 6ACU, 6AGF, 6ABP, 7CC, 7ZI, 7ZJ.

STATIONS HEARD AT 6GF (Sacramento, Cal.)

6AAM, 6AAW, 6AAJ, 6AFM, 6ADU, 6AE, 6AGF, 6AGP, (6ACA), 6ABP, (6AH), (6AJ), 6AN, 6AR, (6AS), 6AT, 6BAA, 6BJ, 6BP, 6BQ, (6CO), 6CP, 6CQ, 6DH, (6DK), (6DP), (6DY), 6EA, (6EB), 6EL, (6EN), 6EP, 6ER, 6EX, (6FE), (6FI), 6GE, 6GI, 6GK, 6GQ, 6HH, 6HP, (6HY), 6IF, 6IG, (6IL), 6IT, 6IU, 6IV, 6IY, 6JD, 6JI, 6JJ, 6JN, 6JQ, (6JR), (6KA), (6KM), (6KP), (6KQ), 6LT, 6MN, 6NE, 6NH, 6NO, 6NY, 6OC, 6OH, 6OT, 6OY, 6PE, 6PJ, (6PQ), (6PR), (6QM), 6QR, (6SK), 6ST, (6TC), 6TX, 6VL, (6XZ), 6ZA, 6ZB, 6ZE, 6ZH, 6ZK, 6ZL, 6ZM, (6ZN), 7AD, (7BP), 7BQ, 7BR, 7BS, (7BV), 7CC, 7CR, (7CU), (7CW), 7DA, 7DG, 7FH, (7GQ), (7GY), 7HE, 7IM, (7IN), 7ZB, (7ZI), 7ZK, (7ZJ), 5ZA, 9LR.

The Chicago Radio Laboratory Announce

THAT the products of this company will hereafter be known, advertised and distributed as the "Z-NITH" apparatus, the mark of highest success.

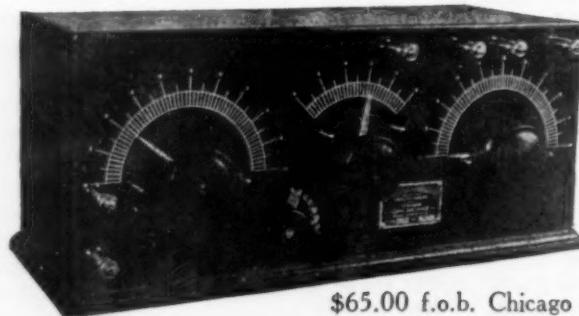
THE broadening field that has been opened up through the perfection of these products and through the adoption of more intensive methods of merchandising make the establishment of this name necessary.

THOUGH the Chicago Radio Laboratory has determined the trend of radio apparatus design for the past three years, there is that about its products which defies duplication and causes it to continue to maintain a distinctive individuality which is at once striking and exclusive beyond imitation.

THE most popular and widely known of these products, the C.R.L. Paragon Short Wave Regenerative Receiver, will now be known as the

Z - NITH

REGENERATOR



\$65.00 f.o.b. Chicago

THERE is a "Z-NITH" product for your every need. Our Engineering Department has been built up by years of effort and embodies a wealth of knowledge and experience in the design and production of special apparatus and installations.

The Chicago Radio Laboratory

Offices: 1316 Carmen Ave. Testing Station: 9ZN, 5525 Sheridan Road CHICAGO, ILL.

RADIO CLUB DIRECTORY

Published every month. It keeps you posted on important meetings.

United Radio Telegraphers' Association, Pacific Coast Division—Rooms 418-420, 24 California St., San Francisco Cal. Phone Douglas 706. All commercial operators eligible for membership. Address communications to above address.

San Francisco Radio Club, Inc., S. F. Gymnastic Club, Sutter and Divisadero Sts., San Francisco, Calif. Meetings every Thursday evening at 8:30 P. M. Visitors welcome at any meeting except first meeting of the month. Initiation fee \$2.50. Monthly dues 50c. For experimental and commercial radio operators, address communications to the secretary.

—adv.

A BUNGLED AFFAIR

(Continued from page 209)

"Well, it won't do him much good, anyway, as long as you happen to be on board," rejoined Peter Bockstrup. "You can arrest him yourself."

Collinge did not immediately answer. He stood silent and seemed to be turning this suggestion over in his mind.

"Yes, I suppose I'll have to arrest him myself," he said, at last, with evident reluctance. "I'm out on an important case—a thousand times more important than any mere jewelry theft, and I don't wish to be mixed up in this thing. He could easily be picked up in San Francisco, but then he know's I'm on board and he'll likely hide the stuff or throw it overboard to save himself. However, I had rather merely declare him under arrest and then turn him over to your captain. He can deliver the prisoner to the police when we arrive, and that will leave me out of it."

The chief wireless operator took Collinge to the captain's cabin and the skipper was made acquainted with the situation. Captain Jensen became greatly excited as he listened to Collinge's talk.

"Yumpin' yiminy!" he exclaimed, rising from his chair. "We shall go right avay an' lock him up in the fo'c'sle."

The three hastened down to the suspected passengers stateroom and found him laying in his bunk, with all his clothes on, groaning with real or pretended seasickness.

"You—!" he screamed, catching sight of Collinge. Half-arising, he quickly plunged his right hand into his coat pocket. Before he could withdraw it, however, Collinge had seized his wrist in an iron grip.

"Keep quiet, Jack Lambert," he grated, in a steely tone, drawing a big automatic from his own coat pocket and sticking it in the small man's face. Releasing the other's wrist, Collinge produced a pair of bracelets.

The captive shrank back against the wall of his bunk.

"Damn you—!" he began, again, and then choked off his speech with a gurgle, as Collinge leveled his automatic at the small man's head and stiffened a finger upon the trigger.

"Shut up and behave or you're a dead one!" ominously threatened Collinge, snapping the bracelets on the prisoner's wrists. "I'm taking no chances with you—not any!"

Collinge began to search the prisoner. From one pocket he withdrew an automatic, quite similar to his own; from another skilfully concealed hiding place he took a tiny, but deadly derringer.

"Yumpin' yiminy, he bane vun bad feller, eh!" muttered Captain Jensen.

"Now let's see the swag," said Collinge, pulling the prisoner's black satchel out from under a pillow. The bag was locked and Collinge searched the captive again, in an effort to find a key. He did not find it, but he did come upon a pocket knife, which interested him.

"This is what he cut the aerial half-yards away with," stated Collinge, briefly, as he opened the knife and examined it. Peter Bockstrup and Captain Jensen looked at it also and they saw that the knife was wet and that a few fibres of manila were adhering to the blade.

The captive's small eyes glittered with rage, but he said nothing.

Collinge neatly slit the bottom of the satchel with the knife. Inside was a single parcel. Cutting the string on it,

Collinge removed several paper wrappings and brought to view an elegant jewelry case. He pressed the catch and the case flew open, revealing a magnificent necklace of large, perfectly matched and almost blue-white diamonds.

"Whew! The Ellingsworth necklace!" murmured Collinge, lifting a part of the thing on his finger and watching it flash and sparkle. "It's worth a hundred and fifty thousand dollars, if it's worth a penny! We've surely caught Lone Lambert with the goods on him, this time!"

The captive's face was ashen and drops of perspiration stood out on his forehead. He was roughly laid hold of and dragged forward through the rain and spray to the forecastle. Here he was pitched into the paint locker, which was the only available place for him. After securing the door with two big brass padlocks, Captain Jensen called a big Finn sailor and ordered him to get a piece of timber and stand guard over the prisoner.

"If he bane get fresh and tries to run avay, chust bust him in the head with the stick," the sailor was instructed. "I skall have the mate take two other fellers to stand watches by you, so he von't have no chances to get avay, by golly!" With this, Captain Jensen led the way aft.

"I skall take care of the necklace?" he queried, when they had reached his cabin. "It vere better inside my safe."

"Yes, you had better put it in your safe," rejoined Collinge, promptly. "I'm carrying some valuable stones myself, and you can keep them all together." As he spoke he drew a large, bulging wallet from his inner coat pocket. From it he took a small wad of tissue paper, which he opened, bringing to view a scintillating, remarkable looking brooch and a number of large unmounted stones. Placing the flat necklace case with the jewels, Collinge carefully wrapped it with the tissue paper, placed the package in the wallet and handed it to Captain Jensen.

"That's a fine pockethook to have now, by golly!" remarked the skipper, as he placed the wallet in the safe and carefully locked the door.

For four days and nights the storm raged, unabated. The little steam-schooner pitched and rolled without a moment's cessation, but, nevertheless, managed to keep making about five knots. During all this time Collinge kept an eye on the prisoner in the paint locker, brought him his food and allowed no one to get near him.

On the morning of the fifth day the "Yosemite" was abreast of Point Reyes. There, the weather suddenly began to improve. As soon as the wind had moderated somewhat Peter Bockstrup had the sailors string a short piece of aerial wire, which he had found among his spare gear. Having no insulators, he suspended the wire with pieces of fresh, dry rope. As soon as the temporary aerial had been arranged, the chief wireless operator tightened coupling of his transmitter and called up NPG.

"W-Q-Y," the San Francisco naval radio station came back, immediately. "Everybody been trying to raise you last four days with rush message ordering arrest and giving full description of crook called Lone Lambert reported aboard your ship—did you copy it?"

(Continued on page 223)

**A C. W. A
ACE EQUIPMENT ACE**

788 Miles on Nine-tenths of an Ampere

In test of our C.W. Transmitter, signals were copied at this distance. (Details on request.)

Complete transmitter mounted on grained formica panel 10x14x $\frac{1}{8}$, including motor generator, 4 A-P transmitting tubes, filter device, filament heating transformer, microphone, antenna current, ammeter plate current milliammeter and all necessary controls, etc. \$395.00 f.o.b. Cincinnati. Complete transmitter less motor-generator, \$285.00.

Equipment so designed that either voice, buzzer modulated C.W. or straight C.W. transmission may be used by throwing single switch on panel. Construction of apparatus and material employed is of usual "ACE" quality.

"You may pay more, but you can't buy better."

THE PRECISION EQUIPMENT CO.

2437 GILBERT AVE., Dept. F
CINCINNATI, OHIO

Get Bigger Pay through ELECTRICITY



3500 PAGES
4700 PICTURES
POCKET SIZE
FLEXIBLE COVERS

\$1 A NUMBER
\$1 A MONTH

Magnetism—Induction—

Experiments—Dynamics—

Electric Machinery—Motors—

—Armatures—Armature Windings—Installing of Dynamos—Electrical Instrument Testing—Practical Management of Dynamos and Motors—Distribution Systems—

Wiring—Wiring Diagrams—Sign Flashers—Storage Batteries—Principles of Alternating Currents and Alternators—

—Alternating Current Motors—Transformers—Converters—Rectifiers—Alternating Current Systems—

Circuit Breakers—Measuring Instruments—Switch Boards—

—Power Stations—Installing—Telephone—Telegraph—

Wireless—Bells—Lighting—Railways. Also many modern Practical Applications of Electricity and Ready Reference Index of the 10 numbers.

Shipped to you FREE. Not a cent to pay until you see the books. No obligation to buy unless you are satisfied.

Send coupon now—today—and get this great help library and see if it is not worth \$100 to you—you pay \$1.00 a month for 10 months or return it.

**SEND
NO MONEY**

THEO. AUDEL & CO., 72
Fifth Ave., N. Y. Please
submit for examination Hawkins
Electrical Guides (price \$1 each).
Ship same prepaid, the 10 numbers. If
satisfactory, I agree to send you \$1 within
seven days and to further mail you \$1 each
month until paid.

Signature _____

Occupation _____

Employed by _____

Residence _____

Reference _____

P.R.N.

Resonance Tuner -- Something New -- Used with Bulb Only

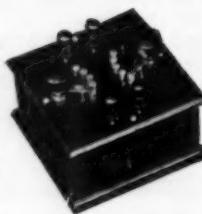
Built on the resonance principle of the new Coils of the U. S. Signal Service. It is a wonder tuner and is wound with pure copper strip with split phase coil inside and out of the winding. IT GETS ALL THE 200 meter stations going and the tuning is done merely with a 21 Plate Condenser in series with the aerial.

Amplification up to 100 times with variometers in series with grid and plate. This tuner will permit you to make a regular paragon at a very small price.

It is truly the wonder tuner and will revolutionize the tuner industry. These have been tested everywhere before being offered to the Amateurs and we will absolutely guarantee every one. Special price—one to each city \$6.00, add parcel post.

TRESCO, Davenport, Iowa.

Send 10c. for
16-page Catalog



Why We Recommend Our Navy Type Headset For Exacting Use



Our Navy Type Headset will produce audible signals from the least amount of current. Since the action is direct on the diaphragm they work at the best mechanical ratio and there is no loss of current necessary to operate intervening mechanical movements. This diaphragm has a natural high pitch which enables the operator to read trans-Atlantic signals more readily through static interference.

The Navy Type is wound to an A.C. resistance of 50,000 Ohms and is peculiarly adapted to vacuum tube reception. Then there is the exclusive Brandes features of perfectly matched tone, which brings in the faintest signals in one clean, clear note.

You can pay more for a headset and you can buy a heavier one but you cannot buy a better one than the Navy on the basis of sensitiveness, comfort or price. Send us \$14. and we will send you a Navy Type Headset. Try it for 10 days. If you aren't satisfied, return the headset and we will refund your money without question.

C. BRANDES, Inc.

Room 819, 32 Union Square, New York City

Also makers of: Trans-Atlantic Headsets, \$12.00
Superior Headsets, \$8.00
SEND 5c FOR CATALOG "C"

"Navy Type, 50,000 Ohms,
A. C., Weight 9 oz., com-
plete with head band and
polarity indicating cord.
Price \$14.00

HOT WIRE AMMETER

A radiation ammeter for C-W or spark stations. Suitable also for measuring filament currents either AC or DC. Supplied in a variety of ranges and for either flush or front of board mounting.

PRICE \$7.75

If our apparatus is not carried in stock by your dealer we can supply you direct.

Send for Bulletin 904C

GENERAL RADIO CO.

Cambridge, 39 Mass.



When writing to Advertisers please mention this Magazine

VARIOMETERS

(Continued from page 207)

suffice to insulate one end of the rod from the other. The connections should all be soldered. One point to remember in doing all soldering is this: be sure the metals you wish to be soldered are heated to the melting point of the solder, otherwise you will not have a perfect connection.

The rotors may be given a coat of shellac before winding, and shellac should be applied as often as necessary to insure it being wet as the wire comes on. Thick shellac should be used; if it is too thin it is useless.

The stator forms are next in line to be made. Figure 2 shows the stator form. It is made in halves in order that the variometer may be assembled. The four halves are turned on a face-plate on the lathe. To start, drill a hole, about $\frac{1}{2}$ inch to $\frac{1}{8}$ inches at the exact center of the square wood block for the stator form and four holes at the four corners in a place where these holes will not interfere with the hole to be turned in the center. The center hole is for a long screw, about $1\frac{1}{2}$ inches to $1\frac{3}{4}$ inches long to locate the wood on the face-plate in exact center and also to hold the little piece that would otherwise drop out in turning the hole out. After the exact center of the wood on the face-plate has been determined, the maple block is screwed on and four screws screwed in through the corner holes. This will securely hold the block in turning, provided too heavy a cut is not taken. First turn the center of the block out and remove the center by removing the center screw. The turning may be then started to fit the template, shown in Figure 2 A. Dimension J is $\frac{1}{8}$ inch and I is $2\frac{3}{8}$ inches. If the builder thinks he can build this variometer with a closer coupling, if accurate workmanship is done, this radius may be lessened, but with a $2\frac{3}{8}$ inch radius the variometer will be efficient and will not require extremely accurate workmanship.

After four stator form halves are turned out, the form for the wire to go into the stator is to be made. The complete form is shown in Figure 4 and the template for turning it out is shown in Figure 4 A. In either figure, Dimension G is $1\frac{1}{4}$ inches, J is $\frac{1}{8}$ inch and radius L should be the same as radius I minus the diameter of the wire to be used. It can be made $2\frac{3}{8}$ inches minus $\frac{1}{4}$ inch, or $2\frac{1}{4}$ inches, $\frac{1}{4}$ inch being the diameter of No. 18 D. C. C. wire. The same form can be used to wind the two grid stator coils with No. 22 D. C. C. wire because it is smaller in diameter and the coil will fit the form a little loosely, but this can be filled with shellac. Referring to Fig-



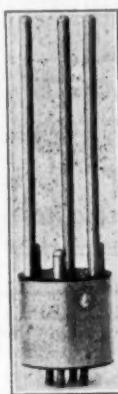
Paragon Rheostat

has become the standard filament resistance. For back of panel or table mounting. 2½-in diameter. 6 ohms., 1½ amps.

\$1.75 Postpaid
Immediate shipment.
Standard VT Socket \$1.00. Why pay More?

44 Volt Variable "B" Battery, \$3.60

Include Postage on 4 Lbs.
Complete in handy wooden case and adjustable phosphor-bronze "Jiffy" connectors. Better than block batteries! If one 4.4 V. unit weakens prematurely, it can be removed and replaced, thereby not impairing the total voltage—making this the best battery value on the market.



1 Audiotron Adaptor

Consists of standard 4-prong base with brass supporting connectors. Permits mounting tube in vertical position, so filament will not sag and touch grid.

\$1.75 Postpaid
Aerial Wire 1c Per Foot
7 strands No. 22 solid copper—tin plated to prevent oxidation. Include postage on 15 lbs. per 100 feet.

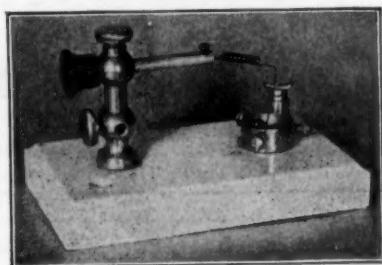
Lightning Switch \$4.00
600 volts, 100 amps., S.P.D.T.

Radio Equipment Co.

630 Washington St.
Boston-11, Mass.

Attention WIRELESS AMATEURS

THE ONLY WIRELESS MINERAL DETECTOR MADE ON A SOLID PORCELAIN BASE. See Cut



This Mineral Detector is a most valuable device to eliminate the Amateur's troubles in Wireless Operating

PRICE \$2.25 EACH
Including Parcel Post Charges

J. N. BREIDENBACH
2413 North 16th St., Phila., Pa.

Stratton Electric Company

We carry a line of Wireless Material, Parts, Small Instruments and Educational Books.
Murdock V.T. Socket.....\$1.00
Chelsea Oscillator.....\$3.00
Chelsea Variable Grid Leak.....\$3.00
Shipping weight ¼-lb. each. Add postage.
Satisfaction Guaranteed. Immediate Deliveries. Try us.
215 Federal St. GREENFIELD, MASS.

ure 4, a wooden plug is turned out which will fit the main winding form. This is to provide a starting flange for the coil to prevent it slipping off the form. The form may be made of any kind of wood since it is only used for winding purposes. Drive two small brads, one in the main form and the other in the plug, as shown in Figure 4. These brads will be used to tie the wire at the ends of the coil.

If a closer fit is desired in the No. 22 wire coils, the form may be turned with Dimension L 2½ inches. This will insure a tight fit. The No. 22 coils are then wound first, the form afterwards turned down ¼ inch in radius, and then the No. 18 coils wound.

The wire is wound by first tying it, with sufficient amount extra for a lead, to the nail on the plug, and then winding it, with considerable tension on the wire, on the form until it runs up to, and three or four turns over, the line indicating the width of the coil; G, in Figure 4. In winding the coil, or any coil, in fact, the wire should always be wound so that it is passed over and under two or three fingers. This is to bend the wire back and forth so that it automatically straightens itself as it winds on the form. Cloth should be used to protect the fingers from wearing and heat. Several thicknesses of cloth are usually necessary. When the coil is wound it should be given three coats of shellac on the outside. The inside of this coil must, of course, not be shellaced while winding, in order that it can be easily removed from the form. The outside coats of shellac should be applied with a day's time between the first coat, and several hours between the second and last coats. The coil is then ready to remove. In winding these coils it must be observed the direction in which they are wound so that a continuous coil, wound in the same direction, will be the result.

Figure 5 shows how this is done. The wooden plug is removed from the main part of the form after the wire has been unfastened from the brad on the plug. The form is then placed in a vise, as Figure 5 shows, and with a piece of hardwood or fibre, is lightly tapped off. The operation of removing these coils from the form requires patience or failure will result. The coil should not be tapped off, or out, more than ½ inch in one place without turning the form in the vice again and hammering in another place. By rotating and hammering slowly and carefully all around the coil will come off perfectly. It is then delicate in this thin shell shape and should be carefully handled. Two coils of No. 22 and two of No. 18 are required for two variometers. Figure 3 shows a sectional view of a stator coil.

The coils are placed in the stator forms by first shellacing both the coil (Continued on page 222)

Corwin Radio Service

LETTERS continue to pour in from hundreds more amateurs, thanking us for the promptness and carefulness, with which their orders were filled. If you want shipments the day your order is received, and apparatus that arrives in perfect condition, send your next order to Corwin. See if you need anything in this list.

Universal Coil-Mounting Plugs—
Anyone can easily make smooth-running mountings with these plugs. Exceedingly accurate. Made to fit Radisco and all hand wound coils.
Price 80 cents, postpaid

VARIABLE CAPACITORS

A. R. Co. .001.....	\$6.25
A. R. Co. .0005.....	5.00
With No. 67 Dial add \$1.00	
Murdock 366	\$4.75
Murdock 367	4.75
Murdock 368	3.75
Clapp-Eastham 800	7.50
Clapp-Eastham 800A	9.50
Clapp-Eastham 800B	11.50

Complete with dial
Shipping weight One Pound.

GRID CAPACITORS

Radisco, Postage 3 cents.....	.35c
Murdock, 3 lbs.....	\$4.50

Clapp-Eastham, 10 lbs.....	12.50
----------------------------	-------

OSCILLATION TRANSFORMERS

Radisco No. 5.....	\$15.00
Via Express collect only	

RADIO CRAFT PRODUCTS

Detector	\$15.00
Two step Amplifier	50.00
Detector and 1 step	45.00
Detector and 2 step	70.00
Postage paid	

"B" BATTERIES

Radisco No. 1, 2 lbs.....	\$1.50
Radisco No. 5, 5 lbs.....	2.65

Eveready Storage battery prices on application

TUSKA C. W. APPARATUS

181 Coil, 2 lbs.....	\$7.50
182 Coil, 2 lbs.....	10.00
183 Coil, 3 lbs.....	12.50
170 Filt., 8 lbs.....	16.00

AERIAL WIRE

7 x 22 tinned copper	
100 feet, 2 lbs.....	\$1.25
200 feet, 4 lbs.....	2.40
500 feet, 8 lbs.....	6.00

AMPLIFYING TRANSFORMERS

A.R. Co., 1 lb.....	\$5.00
Federal, 1 lb.....	7.50

JACKS AND PLUGS

Federal Closed Circuit	85c
Federal Open Circuit	70c
Federal Double Circuit	\$1.00
Federal Plug	2.00

Postpaid

ALL RADISCO COILS and Wireless Press Books.

ROTARY SWITCHES

Clapp-Eastham, No. 19.....	\$1.00
Clapp-Eastham, No. 19A.....	.35
Our Own, No. 1.....	.40
Our Own, No. 2.....	.55
Postage05

CORWIN DIALS

No. 66, 3"	\$7.50
No. 67, 3" with knob	1.30
No. 68, 3¾"	1.00
No. 69, 3¾" with knob	1.70
Postpaid	

RECEIVERS

Murdock No. 55, 2000 ohm.....	\$4.50
Murdock, No. 55, 3000 ohm.....	5.50
Brandes Superior	7.00
Baldwin C	16.50
Baldwin E, Improved	20.00
Brownlie, New	12.50
Shipping weight, 2 pounds	

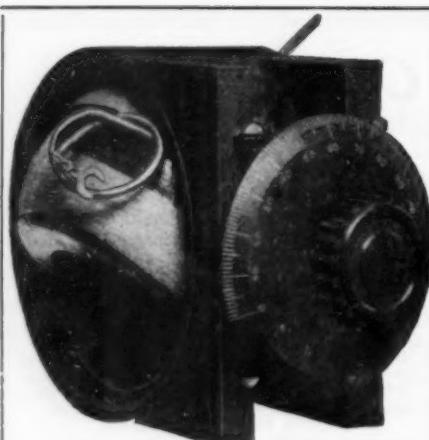
CONTACT POINTS

CP-No. 1 Brass, dozen.....	25c
CP-4 Brass, dozen.....	35c
CP-5, Nickel Plated, dozen.....	45c
Postpaid	

All orders for apparatus not listed as postpaid must be accompanied by postage charges.

A. H. CORWIN & COMPANY

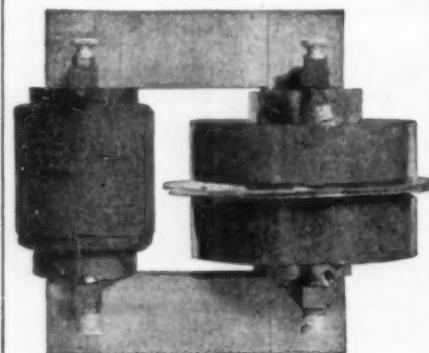
Dept. C3. 4 West Park St., Newark, N.J.



TYPE Z. R. V.

Variometer has unit construction with bakelite shell and hardwood ball. Has low dielectric losses and a range of inductance of 1.25 mil henry maxim to .1 mil henry minimum. Is readily used on table or mounted on panels.

Complete with 3-inch dial and knob \$6.50
Without dial or knob..... \$5.75



TYPE Z. R. L.

Transformer for use with rotary spark gap has two section secondary, bakelite terminal supports and high grade construction, 400 watts power rating highly efficient at 200 meters.

Price \$14.00

Apparatus which excels in those qualities which for 13 years of continuous manufacture have maintained its enviable reputation for reliability will be found pre-eminent in the display rooms of discriminating dealers and is manufactured by

CLAPP-EASTHAM COMPANY
140 Main St., Cambridge, Mass.

Catalogs mailed for 6c stamps.

VARIOMETERS

(Continued from page 221)

and inside of the stator form with thick shellac and pressing the coil carefully into the form before the shellac is dry. Be sure that the shellac is not dry, otherwise the stator coil will not stick properly to the form.

Refer to Figure 6. The bearing block is made of $\frac{1}{8}$ inch or $\frac{1}{4}$ inch brass with Dimension N, 1 inch, and M, 2 inches. The hole in the center must be drilled to allow the shaft to turn easily in it. The four screws which hold the bearing block must be of such length that they will not come through the form and disturb the stator coil. $\frac{3}{4}$ inch round-head brass screws are about the right size. No iron or steel should be used in the construction of the variometer it is to be noted.

The variometer is now ready for assembling. The outside of the variometer stator halves should be so made, and they will be if instructions are followed, that they will register perfectly when the inside holes are exactly opposite each other. The screw shown in Figure 6 at the edge of the variometer is used to hold the stator halves $\frac{1}{4}$ inch apart. By carefully locating the screw holes for the bearing blocks the rotor will turn without touching the stator coils, and equally distant from them, when the variometer is assembled. The builder should be able to spin the rotor without the rotor touching any part of the stator coil. At first the rotor may work hard, due to the shafts being slightly out of line or because the bearings are not worn in properly. The builder must provide some means of preventing end play. A brass collar with a set screw will accomplish this nicely, between the panel and the bearing block.

In Figure 7 is shown a good hook-up for a regenerative receiver. The primary inductance may have a variable shunted across it to increase its wave lengths or placed in series with the antenna to shorten the received wave lengths. V_1 is the variometer wound with No. 22 wire and V_2 is the one wound with No. 18 wire. As shown in the figure, the coils of the variometer are connected in series.

FARRALONES RADIO COMPASS DAMAGED

The radio compass station at the Faralones was out of commission for a week, according to advices received at the Twelfth Naval District headquarters. Waves from a storm washed over the station, nearly washing the station house into the ocean and damaging the apparatus.—San Francisco "Call."

BURGESS "B" BATTERIES

SEVERAL
SIZES
FOR
SPECIAL
WORK



SEND FOR CATALOGUE
**BURGESS BATTERY
COMPANY**

HARRIS TRUST BLDG.-CHICAGO, ILL.

"B" Batteries AN EVEREADY PRODUCT

Guaranteed 45 volts
Six Taps

**\$5.00 prepaid anywhere in
the United States**

We also build any type of set to
order. Send us your specifications.

Ets-Hokin & Galvan
Wireless Engineers
10 Mission Street San Francisco

New 1921 Reduced Prices!

Type CSU balanced variable condenser Bakelite insulated, with $4\frac{1}{2}$ " silver plated Navy dial indicator.

.0006 mfd. \$6.00. .0011 mfd. \$6.50

Postage paid.

Sorala split-secondary modulation transformer \$6.00 postpaid.

6" threaded Bakelite tube for VT transmitting inductance \$3.50 postpaid.

While made to sell at a higher price we
are taking a narrow margin on

TYPE J AMMETERS AND MILLIAM-
METERS, postpaid. 0-3 Amps. \$7.00;
0-5 Amps. \$7.00; 0-100, M.A. \$7.00;
0-300 M.A., \$7.00; 0-500 M.A., \$7.00.

By consulting our 1921 Bulletins, sent
for 4c, you can build a phone at a reasonable
price and be satisfied.

SOMERVILLE RADIO LABORATORY

SOMERVILLE RADIO LABORATORY
102 Heath St., Somerville, 45, Mass.

A BUNGLED AFFAIR

(Continued from page 219)

"N-P-G, de W-Q-Y," pounded Peter Bockstrup. "No, didn't get message, but we got crook safe—he cut aerial away first day out—couldn't fix it account no spares and bad storm—here's radio—Yosemite ck 14 dh rush Police S. F.—Have Lone Lambert prisoner will dock Meiggs wharf ten A. M.—Captain Jensen—."

Just as Peter Bockstrup was finishing off, he saw his aerial ammeter suddenly drop down to zero. Looking outside, the chief wireless operator saw that the rope insulator farthest from the lead-in evidently had been burned off by leaking current at the point where the wire joined the rope, with the result that the forward end of the improvised aerial had fallen to the deck and grounded.

As the ship was almost in port, and as he could see no particular necessity for getting the message describing Lone Lambert and ordering his arrest, when the criminal was already held captive, Peter Bockstrup decided not to try to do anything more with the aerial. Instead, he set about changing into his "shore clothes."

An hour and a half later, the "Yosemite" slowly worked her way alongside at Pier 41. Surrounded by a large crowd of curious spectators, were two plain-clothes men and half a dozen policemen, waiting, with the patrol wagon, on the pier. Farther up the landing, near the street, a big, speedy-looking grey car backed up unobtrusively behind a pile of lumber and waited.

The ship had hardly been made fast when the detectives and policemen scrambled aboard.

"Where is he?" they demanded in a chorus, as they came up on the upper deck, where Captain Jensen and the chief wireless operator awaited them.

"Come right this way, gentlemen," said the skipper, proudly, leading the way. "He bane locked up forrad in the paint-locker."

Reaching the forecastle, the policemen all drew their revolvers and stood watchfully waiting as the skipper unlocked the door of the paint locker and threw it open.

"Hell!" burst out one of the plain-clothes men, upon seeing who was inside. "That's only Jack Evans, one of De Lacey's special messengers!"

"But the detektive said he bane vun Lonely Lambert feller!" spluttered the skipper, sensing, even in spite of his thick-headedness, that something was very much wrong.

"What detective?" demanded the plain-clothes man.

"It was Lone Lambert himself," interposed the messenger, glumly, as he stepped out of the paint locker. "He played one of his old favorite games again—flashed a fake Pinkerton badge and a pair of bracelets. When he took my gats he slipped a jack-knife in my pocket, and then pulled it out again, a minute later, so as to make it look as if I was the one who had cut down their wireless aerial. You know, Lone Lambert's bait is good enough to fool even smart fish, and as for these two simple-brained suckers—they just swallowed the hook, line, sinker, and all! That's all there is to it."

"But, why—?" began the plain-clothes man.

"Oh, I couldn't do a damned thing," interrupted the messenger, shortly, knowing what the detective was going to say. "He kept a big automatic in my face

(Continued on page 229)

Wesrad Mail Order Service*"Everything in Radio"*

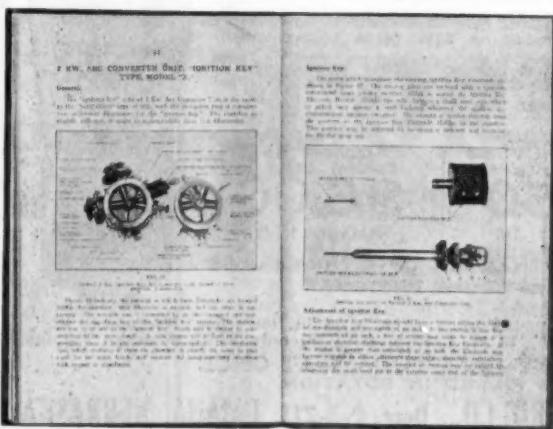
Prompt Delivery---
Courteous Service

*Send for Our Latest***Stock Bulletin and Price List****Western Radio Electric Company**

550 SOUTH FLOWER ST.

LOS ANGELES, CALIF.

— **A GOLD MINE**
OF INFORMATION ON THE
FEDERAL ARC



**THE ONLY
BOOK OF ITS
KIND ON THE
MARKET.**

**COMPILED
BY THE
ENGINEERS
OF THE
FEDERAL
TEL. CO.**

NOTE THE ILLUSTRATION. This is a specimen of the method used by the Federal Engineers to illustrate and explain the operation of the modern radio arc. The book thoroughly covers the operation and care of the 2 K.W. and 5 K.W. installations for ship and shore stations. Many circuit diagrams and elementary principles are treated precisely. A large map of various arc stations in operation throughout the world is included in this book. Every radio student should have a copy.

Contains 37 illustrations and half-tones of the various arc systems. Heavily bound and ready for immediate delivery. It is of as much value to the amateur as to the commercial man. Many vessels operated by the U. S. Shipping Board are equipped with the Federal Arc. This is your opportunity to acquaint yourself with the latest radio systems. Arc operators are given preference by many radio service companies. You are not a full-fledged operator if you do not understand the arc.

\$2.50 PER COPY, POSTPAID IN THE U. S.

**THE SUPPLY
IS LIMITED**

**ORDER YOUR
COPY NOW**

**PACIFIC RADIO PUB. CO.
50 MAIN STREET**



INCREASE YOUR TRANSMITTING EFFICIENCY. Use a Ray-Di-Co. SYNCHRONOUS SPARK GAP

Constant time interval between discharges of equal amplitude. Clear clean cut spark tone. Makes decrement extremely low. Keeps oscillations of open circuit out of closed circuit. Puts the current where it belongs, in the antenna. Motor follows every voltage variation obtaining the maximum condenser discharge. Total length of conductors in gap less than 3 inches, permitting the use of a larger condenser. Adjustable stationary electrodes, large discharge surfaces, Bakelite-Di-electro Grade XX used throughout. Quiet running. Motor of single phase SYNCHRONOUS type, 1/6 H. P. 110 volt, 60 cycle. Net wt. 35 lbs. F. O. B. CHICAGO \$85.00.

RAY-DI-CO. 2653c N. Clark Street CHICAGO
Specializing in the designing and construction of Radio Phones to your specifications.

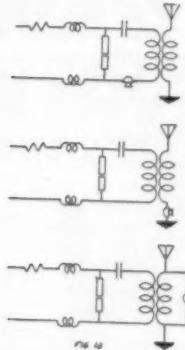
ARC RADIO APPARATUS
(Continued from page 213)

Fig. 13 shows various arc radiophone hookups. Many more combinations and arrangements are possible, but these are the more common ones.

Jennings B. Dow.

(The End)

RUB YOUR EYES AGAIN!

TALK ABOUT SALE—HERE'S A GOOD ONE

(By special popular request we are extending this record-breaking sale 30 days more. If you missed out in the opportunities in our ad. in the Jan. "P.R.N." here's your chance now.)

And the reason for the sale? Well it's this. The C and S Catalog is ready. We need your address to send you a catalog. So we figured that by offering these remarkably low prices, you will grasp the opportunity and order some apparatus. Thus, we will secure your address and send you a catalog. So, in this ad we are offering superlative apparatus selling at EXTREMELY LOW PRICES.

GENUINE RADIOTRONS

Those ultra super-sensitive detector and amplifier bulbs. Absolutely the best bulbs sold. Detector operates on 22½ plate voltage; amplifier 45 volts. For maximum results and efficiency you should use "radiotrons." Order today—while the price is low!

Regular \$5.00
Detector UV 200
Special price only
\$4.50
Postage 1 lb.

Regular \$6.50
Amplifier UV 201
Special price only
\$6.00
Postage 1 lb.

NOT MORE THAN SIX OF EITHER TUBES
SOLD TO ONE CUSTOMER

BAKELITE PANELS 6 in. x 6 in. x 1/8 in. only 89c. Postage 1 lb.
12 in. x 6 in. x 1/8 in. only \$1.77. Postage 1½ lbs.
SAVE MONEY—BUY TODAY—AT ONCE
ORDERS FILLED IN ROTATION

THE C and S RADIO ELECTRIC CO., Dept. P-2-21 OMAHA, NEBRASKA

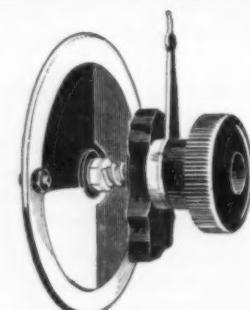
A 15-mile Radiophone

Out of a large stock of genuine double filament, double life, Audio Trons, we have carefully selected and tested a limited number of tubes which are especially adapted to be incorporated in Mr. H. D. Selvage's 15 mile radiophone operating on "B" batteries. inc.

His circuit, together with directions for assembling, advertised elsewhere in this magazine, has been thoroughly tried and proven by a large number of amateurs who are now talking over remarkable distances.

We are offering you an excellent bargain by cutting the price of these specially selected genuine double filament Audio Trons from \$6 to \$5 each. Results are positively guaranteed when our tubes are used in connection with Mr. H. Selvage's radiophone circuit.

The Kehler Radio Laboratories
Dept. Z, 901 W. 1st St.
Abilene, Kansas



A New Invention

The Parkin .001 mf Variable Condenser (pat. applied for) fills the long felt want for a rugged, low priced, balanced variable condenser for panel mounting. No plates to bend and short circuit. Cannot get out of order. Has very low minimum capacity. Easily mounted, only one small hole being necessary in the panel.

Guarantee: All Parkin Condensers are sold subject to return within five days if not fully satisfactory.

No. 50 .001 mf Unit alone, may be mounted on any shaft....\$1.50 postpaid
No. 51 .001 mf Unit with knob, pointer, etc., as shown.....\$2.00 postpaid
No. 52 .001 mf Unit with knob, etc., and 3-inch black dial\$2.50 postpaid

Write for full description of this new invention

Ask for Circular No. 16

PARKIN MFG. CO.,

Dealers: Write for discounts

San Rafael, Calif.

Hams—

Why not get in on the long wave stuff?

Use Radisco coils.

Here is a combination that gets fine results for everybody that uses it.

LRD 1200 for Primary
LRD 1200 for Secondary
LRD 550 for Tickler

Special introductory offer

This combination sent anywhere in the U. S., postpaid, for \$6.50. Send your order today. The coils will be shipped immediately, and you can start right in on your long range work.

Kelly and Phillips

312 Flatbush Ave., Brooklyn, N. Y.



Yes—for *YOU*, you radio amateurs who live in the great *WEST*, for you particularly. Because it lists, pictures, and describes the complete radio lines of this big Western supply house from whom you can get every bit of radio apparatus you need—quickly and cheaply, right in your own territory. And select it all from this one big, handy book.

—AND-OH BOY! IT IS SURE SOME BOOK!

Newest, latest, and best radio equipment shown, described, explained, and priced in a single comprehensive volume. You need it as an up-to-date reference book. You need it as a complete catalogue. You need it as an instructive radio manual. You need it as a guide in the selection, purchase, and use of CW and Radiophone equipment. Send 35c in stamps NOW and get your copy by return mail. Don't delay—the supply is limited. The 35c is refunded with your first \$1.50 purchase from us, but must accompany your request for the book. Address—

Leo J. Meyberg Company

428 MARKET ST.—SAN FRANCISCO, CAL.
Successors to Haller-Cunningham Electric Co.

Quick service. Low prices. All standard makes of apparatus. Pacific Coast distributors for A. H. Grebe & Co., General Radio, Pacent Electric Co., and Dubilier Condensers. The big, new catalogue-manual contains all. Send 35c for it NOW.

Buy Your Radio Apparatus on the Pacific Coast

De Forest, Amrad, Radisco, Bunnell, Murdock, Moorhead and other apparatus carried in stock at list prices F.O.B. Seattle.

MAGNAVOX AGENCY

Arco Amplifying Transformers.....	\$5.00
Federal Transformers	7.50
Mica Grid Condensers.....	.50
Genuine Navy Rheostats.....	2.75
45-volt "B" Batteries.....	5.00
Audion Panels	11.00
Audion Panels (professional).....	15.00
1-stage Amplifier	22.50
2-stage Amplifier.....	40.00

We reached Portland (150 miles) with our type "O" Radiophone using AC. Why not install one?

Northwest Radio Service Co.

609 Fourth Avenue

Seattle, Wash.

FORMICA

SHEETS - TUBES - RODS

Made from Anhydrous Redmanol Resins

Formica is a homogeneous waterproof insulation with exceptionally high dielectric properties. It is readily machined and does not warp or shrink.

Formica is the ideal material for panels and other insulation parts of Radio Apparatus, on account of its superior electrical and mechanical properties, as well as its splendid appearance.

THE FORMICA INSULATION CO.

Cincinnati, Ohio

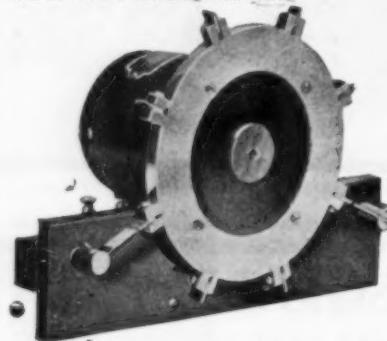


Pacific Coast Representatives:
Hermans-Griffith Co., Sheldon Bldg., San Francisco
Jobbers: Leo. J. Meyberg Co., 428 Market St., San Francisco; The Wireless Shop, 511 W. Washington St., Los Angeles, Cal.



DUCK'S New Big-200 Page No. 14 Wireless Catalog 21 and 27

Mailed for 12c, either in stamps or coin, which amount you are privileged to deduct on your first order of \$1.00. Catalog positively not sent otherwise. This edition of our wireless catalog is the most complete and elaborate we have ever put out. It embraces everything in wireless worth while. As an encyclopedia of information it is invaluable. It is printed on excellent paper with a beautiful cover. Your amateur friend will tell you that there never has been any wireless catalog to take the place of Duck's, and above all, that you can absolutely rely on the quality of every instrument listed in this catalog. In a word it is all worth while catalogs in one.



has contacts of tempered flat copper of proper length and width, easily and quickly removable, and inexpensively renewable; the stationary contacts are adjustable to any length.

The picture above really does not do it justice. There is no rotary gap we have ever sold that we consider in the same class with this gap, and we have therefore discontinued the sale of all other types listed in our catalog.

Any purchaser is privileged to return it within three days if it does not come up to all the high claims we make for it. A first-class Rotary Gap is the very heart of an efficient transmitting set, and we cannot too strongly emphasize care in the selection of this instrument if effective and dependable results are desired.

No. A1798—Improved Type Sayville Rotary Gap (shipping weight 9 lbs.).....	\$27.50
Renewable Rotary Electrodes (not less than five sold), each.....	.05
Renewable Stationary Electrodes, each.....	.10
Type A Motor as supplied with above gap (shipping weight 6 lbs.).....	15.00

THE WILLIAM B. DUCK CO., 210-212 Superior St., Toledo, Ohio

CRASH!

20% DISCOUNT ON THE FIRST FIVE

BANG

Order from each city of one or more of our Type V1R complete vacuum tube receiving outfitts on genuine Formica "Hi-Grade Special" panel complete with H-C coil mounting, rheostat, grid leak, grid cond., socket, 23 plate var. cond., etc. Connections soldered to lugs under machine screws, covered with insulating tubing. Only \$16 less 20%; without var. cond. \$12 less 20% P. P. Same discount allowed on all types. Stamp for full list. Cash or one-third with order, balance C. O. D.

HI-GRADE WIRELESS INSTR. CO., ASHEVILLE, N. C.

The Best and Most Worth Worthy

course in Radio Telegraphy ever published commences with the February issue of Experimental Science.

Written by one of the foremost radio men in America. Edward T. Jones, Associate Radio Editor Experimental Science Magazine.

Other features: Construction of apparatus; new hook-ups; articles on electricity, chemistry, physics and science in general.

Each issue puts it over on the previous one.

Subscription rate \$1.50

EXPERIMENTAL SCIENCE PUB. CO., Inc.

312-1311 G ST., N.W.

WASHINGTON, D.C.

When writing to Advertisers please mention this Magazine

CRITICISING THE DEPARTMENT OF COMMERCE—UNJUSTLY

(Continued from page 214)

equipment of the ship and it is not necessary to hide them under the bunk or lock them up in some other nook to offset the possibility of having them seen by the "Powers That Be" upon arrival at port.

Experimentation is a mighty good thing, and if a fellow has a bit of ambition and an opportunity which does not conflict with his routine, the use of vacuum tubes even in connection with long wave receiving apparatus is not such a bad plan, but when one man copies press from NSS all the way around the world and gives it to the "Skipper" and the crew, you can easily imagine what the next fellow is up against, when, with the same set and the old crystal detector, he can't copy the weather from NAA more than a few hundred miles. "Skippers," for the most part, know nothing more about radio than to howl for press, weather reports and time signals, and when they don't get them the thought is apparent, if not expressed, that the man with the ear muffs is unskilled in radio. Another angle of the experimentation game is that it is sometimes very costly for the company in control of the radio equipment, as well as a menace to safety of life at sea.

There is a line operating steamships from one of our large ports which has posted instructions in all the radio rooms of its vessels forbidding adding any kind of equipment to the original installation. This ruling was brought about by the fact that one man ruined the secondaries of three different receiving sets. He was using some valve stuff of his own and got some of the wires mixed up, with the result that the secondaries went up in smoke. The bills for the repairs are probably the cause for the order, but in addition to the cost there is a more important consideration: what might be the result, if the ship had been in distress with her receiving set shot to pieces?

This sea-going experimentation generally necessitates various changes in the circuits of the ship's receiving equipment, which in every instance should be put in shape again before leaving the ship in the home port. The reason for this is that none of us know whether or not we will sail on the same vessel again or will even have time to visit the vessel to make the change-over before we go somewhere else. In the meantime, some other man may be assigned to the ship and, not being familiar with the change made to the tuner circuits, will be up against it, especially if he is inexperienced. Work of this kind is going on all the time, and it is up to the man who does it to be sure that he does not cause

(Continued on page 228)

Here's a SURE Winner

For long distance work you can find nothing to beat the



Type CR-3A
Short-Wave Regenerative Receiver
and
Vacuum Tube Unit



Compact, complete, dependable, with a wave-length range running up to 375 meters, it fills the need for a moderate-priced regenerative receiver. Built in every way up to the Grebe standard.

The CR-3A includes a variable antenna circuit, continuously variable grid and plate circuits, a specially designed coupling circuit and a standard vacuum-tube mounting with a grid condenser and leakage element. All binding posts are conveniently located on the front of the panel. The price, \$45.50, is within the reach of all.

Be sure to ask your dealer about the CR-3A.

GREBE RADIO apparatus is licensed under the original Armstrong and Marconi patents.

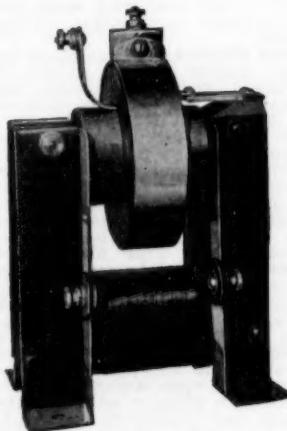
Central Radio Institute, Independence, Mo.
Continental Radio and Electric Corp., New York
Detroit Electrical Co., Detroit, Mich.
Doubleday-Hill Electric Co., Pittsburgh, Pa.
Electrical Specialty Co., Columbus, Ohio
Holt Electric Utilities Co., Jacksonville, Fla.
Hurlburt-Still Electrical Co., Houston, Texas
Kelly and Phillips, Brooklyn, N. Y.

Klaus Radio Company, Eureka, Ill.
Manhattan Electrical Supply Co., New York, Chicago, St.
Louis
Leo J. Meyberg Co., San Francisco, Cal.
Pacent Electric Co., Inc., New York City

Phila. School of Wireless Telegraphy, Phila., Pa.
Weber Radio Electric Co., Los Angeles, Cal.

A. H. GREBE & CO., Inc., 74 Van Wyck Blvd., Richmond Hill, N. Y.

Thordarson Gold Medal Apparatus



TYPE "RS"
TRANSFORMER

TYPE RS
a non-resonant transformer with a low secondary potential designed to give the highest possible power factor.

1	KVA	15,000 volts.....	\$30.00
1/2	KVA	10,000 volts.....	20.00
1/4	KVA	8,000 volts.....	15.00

TYPE R
Resonant Transformer

1	KVA	25,000 volts.....	40.00
3/4	KVA	10,000 volts.....	28.00
1/2	KVA	10,000 volts.....	22.00
		POWER CONDENSER	25.00
		OSCILLATION TRANSFORMER	10.00
		R8 Rotor (8 tooth).....	5.00
		R12 Rotor (12 tooth).....	3.00
		R16 Rotor (16 tooth).....	5.00

Please specify size of shaft.

THORDARSON ELECTRIC CO.

513 S. JEFFERSON ST.

CHICAGO, ILL.

"INSULATE"



Knobs, Handles
and
INSULATION SPECIALTIES
for WIRELESS, etc.
moulded of "INSULATE"
Best Substitute for Hard Rubber or "HI-HEET"
resisting synthetic material

GENERAL INSULATE COMPANY
1026 Atlantic Ave. Brooklyn, N. Y.



CRITICISING THE DEPARTMENT OF COMMERCE UNJUSTLY

(Continued from page 226)

his relief a great deal of trouble. Connections which are soldered should not be tampered with unless we have the necessary tools and the necessary knowledge for putting the set in its original condition. Of course, such experimentation, except in special instances, is not looked upon favorably by the owners of the equipment, but that is not going to stop it.

WANTED

Amateurs to Secure Subscriptions
PACIFIC RADIO NEWS
Pacific Radio Pub. Co.
50 MAIN ST. SAN FRANCISCO

Pacific Radio School

"Arc" and "Spark" Systems

433 CALL BUILDING, SAN FRANCISCO

Send for Descriptive Circulars

Telephone Kearny 2778

BAKELITE-DILECTO

The standard insulating material for all radio work. Water-proof, permanent, strong, used by all important manufacturers of wireless apparatus and others requiring the utmost in insulation.

Furnished in sheets, rods and tubes.

We also manufacture VULCANIZED FIBRE in sheets, rods and tubes and CONITE, a special insulation, in sheets or rolls from .005" to .020" thick.

Let us show you how our standard products can be made to solve your insulation problems.

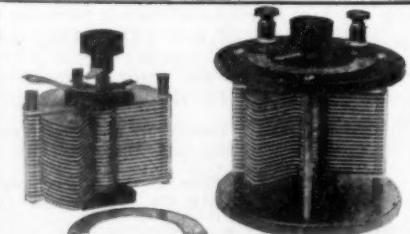
THE CONTINENTAL FIBRE CO.

NEWARK, DELAWARE

233 Broadway, New York City
525 Market St., San Francisco, Cal.

332 S. Michigan Ave., Chicago, Ill.
411 S. Main St., Los Angeles, Cal.

1710 Royal Bank Bldg.,
Cor. King and Yonge Sts., Toronto, Ontario, Canada



THE "ILLINOIS" VARIABLE CONDENSER

The Condenser with "Star Spring" Tension

MADE RIGHT - STAYS RIGHT Hard Rolled Aluminum Plates

These condensers are made by a watch mechanic, schooled in accurate workmanship and who can't get over the habit of critical inspection.

Three Styles: No. 1, Panel; No. 2 Open Type as shown; No. 3, Fully Enclosed. Anti-Protegee. Less than pre-war prices. Fully assembled and tested.

Style No. 1	No. 2	No. 3
67 Plates \$7.00	\$	\$
43 " 3.50	4.50	4.75
23 " 2.75	3.75	4.00
13 " 2.25	3.25	3.50

Money back if not satisfied. Just return condenser within 10 days by insured P.P.

With Style No. 1, we will, if desired, furnish 3 inch Dial with large knob, instead of Scale and Pointer. Extra Price 75 cents.

Sent Prepaid on Receipt of Price

Except: Pacific States, Alaska, Hawaii, Philippines and Canal Zone, add 10c. Canada add 25c. Foreign Orders other than Canada not solicited.

The "ILLINOIS" is rapidly adding to the number of its friends. The bouquets they fling only spur us to still more careful work, and more rigid inspection. It is a matter of pride that among the thousands of instruments sent out, not a single complaint has been received of bad condition. This may possibly be because every instrument is subjected to the scrutiny of the "old man's" eyeglass.

Patent is pending on the "Star Spring" feature, which is very valuable. The action of this spring produces an unvarying friction that holds the "rotor" in any position to which it may be set, and at the same time automatically centers the plates in relation to each other, and prevents and possibility of "endshake."

The plates are in proper relation by construction, and will remain so, obviating any necessity of readjustment. Once right, always right. Once mounted on your panel, there is one thing that you can depend upon to never give you trouble.

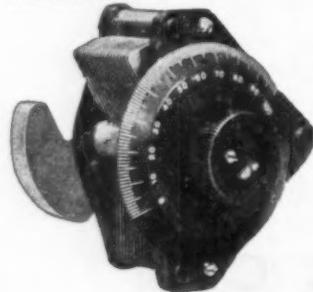
We thank our friends for their letters of generous appreciation.

Kindly note: We issue no Catalog, and make no "trade discounts." We set our prices at the lowest limit, and leave the "middle man" out for the sole benefit of the "consumer."

G. F. JOHNSON
625 Black Avenue Springfield, Ill.

CHELSEA Variable Condensers

Condenser No. 3



(Die-Cast Type)

No. 1—.0011 m.f. mounted	\$5.00
No. 2—.0006 m.f. mounted	4.50
No. 3—.0011 m.f. unmounted	4.75
No. 4—.0006 m.f. unmounted	4.25

Bakelite Dials only75

Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates.

Unmounted types will fit any panel and are equipped with counterweight.

Purchase from your dealer; if he does not carry it, send to us.

Bulletin upon request.

CHELSEA RADIO COMPANY

13 FIFTH STREET CHELSEA, MASS.
Manufacturers of Radio Apparatus and Moulder of Bakelite

A BUNGLED AFFAIR

(Continued from page 223)

all the time and if I'd said one word he'd shot me dead—you know Lone Lambert!"

"Vait, it's all right, it's all right!" suddenly burst out Captain Jensen, in a tone of vast relief. "The package with the shinys is right in my safe."

The skipper rushed aft to his cabin, followed by the rest of the crowd. Making for his safe, the commander of the "Yosemite" hastily turned the combination, swung the door open and took out the bulging wallet.

"By golly, you see now, I wasn't so foolish that I let das feller keep the necklace!" he exclaimed, triumphantly, as he removed the package from the wallet. Hurriedly, he tore away the tissue paper—then stopped and stared with an oath of incredulous dismay.

The little package contained only a few small crap dice and an empty necklace case!

Out on the pier, the big grey auto sped swiftly away and disappeared into the traffic of the street.

(The End)

343 S. Fremont Ave.,
Los Angeles, Cal., Jan. 2, 1921.
Editor Pacific Radio News,
50 Main St., San Francisco, Cal.

Dear Sir:

Having recently finished my new home-made variometer type regenerative receiver, designed both after the pattern of the "Paragon RA6" and the "CRL Paragon," I am letting the fellows know through your magazine the results obtained from it.

On New Year's eve, Mr. McIntosh (6KI), an old-time radio friend of ours, now a resident of Glendale, a suburb of Los Angeles, was here to "listen-in," when using a one stage amplifier (pre-war "Electron Relay" detector and "Western Electric VT-1") in connection with the above receiver and "Baldwin" phones, we heard the following stations outside of California, in fact, the signals could be heard easily at a distance of five feet or more from the phones and all over the room at times, those most noticeable being 5ZA (Roswell, N. M.), and 7YA (Boise, Idaho). About a week ago, I heard 5ZJ (Mesilla Park, N. M.), and 6ZM (Salt Lake City, Utah) with the same audibility as above. Other stations copied with good audibility are 7CC (Moscow, Idaho), 7BQ (Pullman, Wash.), 7ZJ (Vancouver, Wash.), 7BP, 7DA, 7ZI (Portland, Ore.), 7GQ (Eugene, Ore.), 6JT, 6PE, 6OT, 6ZA (Salt Lake City, Utah), 6ZH (Richfield, Utah), 6BQ, 6QR (Reno, Nev.), 6UO (Yerington, Nev.), 6IG, 6GE (Douglas, Ariz.), together with a larger number in California.

Wishing continued success to the "P. R. N." for the New Year, I am,

Very truly yours,
H. C. SEEFred, Radio 6EA.

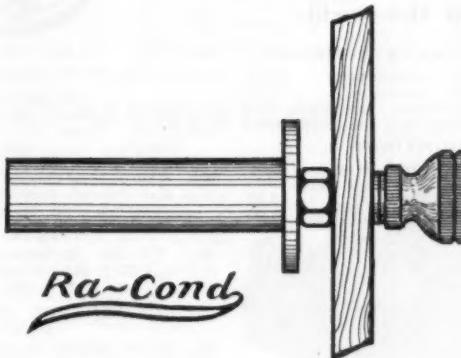
R A - C O N D

CONDENSERS You Will Eventually Use

Hermetically sealed, insuring protection against leakage.

Made in two standard capacities. Phone Condensers .003. Grid Condensers .0003.

PRICE 75c
Postpaid in U. S.



The unique patented construction improves efficiency of your audion or amplifying panel,

eliminating unnecessary binding posts.

RA-COND will fasten on rear of panel to the grid or secondary binding post.

Manufactured only by

RADIO EQUIPMENT COMPANY

1525 NORTH FAWN ST., PHILADELPHIA, PA.

SECURE RA-COND CONDENSERS FROM YOUR DEALER, OR IF HE CANNOT SUPPLY YOU, SEND DIRECT, GIVING YOUR DEALER'S NAME

PROMPT MAIL service, from the heart of New York. We are in position to secure the latest things in radio development, first. We handle large enough quantities to get *preferred* shipments from the makers. Our prices clearly reflect the savings of a large volume of business at low expense. We have built up a sales force that is competent to help you in your selection. Mail orders are filled promptly and accurately, carefully shipped, and guaranteed to arrive safely. Send 10c for our new 84 page complete radio catalogue, *to-day*.

SPECIAL: Radio Service and Mfg. Co.'s ALUMINUM VT SOCKETS. Order a supply direct from this ad. We have plenty of these splendid sockets right here in stock, ready to be shipped the day we receive your order.

Single socket	\$1.10
Double socket	2.75
Triple socket	3.75

American Electro Technical Appliance Co.

235 Fulton St.

Dept. PR.

New York.

"The Radio Telegrapher"Official Organ
UNITED RADIO TELEGRAPHERS' ASSOCIATION

Room 303

44 Broad Street, New York

Read about what's going on among the Commercial, Navy and Army operators

ON SHIPBOARD

AT SHORE STATIONS

AT HOME AND ABROAD

Subscription Price \$1.50 yearly, 15 cents a copy

Radio Apparatus

Distributors of Reliable Radio Apparatus to Schools, Colleges, and Experimenters all over the world.



AMPLIFYING TRANSFORMERS

No. 166A Gen. Radio, unmounted....\$4.50
No. 166A Gen. Radio, mounted..... 7.00
No. Z7392 Clapp Eastham, unmount. 4.00
No. Z7392A Clapp Eastham, mounted 6.50

COIL MOUNTINGS

No. LC-101 with gears and base....\$12.00
No. LC-201 with gears and base and primary switch..... 13.00
No. LC-100 with gears but no base. 9.00

CONDENSERS (Variable)

No. F-800 .0006 Clapp Eastham Bal. \$7.50
No. F-800A .001 Clapp Eastham Bal. 9.50
No. F-800B .0015 Clapp " Bal. 11.50

CONDENSERS (Low Voltage)

No. ES-335 1 MF 500 Volts.....\$1.25
No. ES-356 2 MF 500 Volts..... 1.25
No. 21 AA Western Elec. 1000 volts
A.C. 2.50

OMNIGRAPHES

No. 2 15 Dial Machine.....\$30.00
No. 2A 5 Dial Machine..... 22.00

REGENERATIVE RECEIVERS

No. CR-1 Grebe 175-680 Meters....\$90.00
No. CR-2 Grebe 175-680 Meters....51.00
No. CR-3 Grebe "Relay Special"
175-680 Meters 65.00
No. CR-3A Grebe's Latest with tube
control, 175-375 Meters 45.50
No. CR-6 Grebe 175-680 M. Det. and
2-step amplifier 200.00

IMPORTANT! Every article listed sent to any part of the United States Postage or express prepaid. We want your business! "Let 'PITTSCO' products, service and delivery solve your Radio problems"

SEND US YOUR ORDERS TODAY!
Catalog No. 22 just out, sent upon receipt of ten cents in stamps. "PITTSCO" SERVICE REACHES ALL OVER THE WORLD! WHY NOT LET IT REACH YOU?

No. CR-7 Grebe 500-20000 Meters
"Long wave Special".....\$210.00

TELEPHONES

Baldwins Type C, Navy Standard. \$16.50
Baldwins Type E. "Super sensitive"..... 20.00
Baldwins Type F, very small, light. 21.00
No. CW-834 Western Electric..... 13.50
No. P-1 Brown 4000 ohms, extremely
sensitive and light..... 20.00

VACUUM TUBES

No. UV-200 Radiotron detector.....\$5.00
No. UV-201 Radiotron amplifier..... 6.50
(These are the Radio Corp's new tubes)

CONDENSERS TRANSMITTING (Dublier)

No. D-100 250 W. 10,000 V. .007 mf. \$19.00
No. D-101 500 W. 14,000 V. .007 mf. 20.00
No. D-102 1000 W. 21,000 V. .007 mf. 45.00

ROTORS

No. 443 Murdock, 3-16, $\frac{1}{4}$ or 5-16" shaft 3.00
No. T-1 Thordarson 8 to 16 pt. 6.00
No. B-1 Benwood 8, 10 or 14 pt. 8.00
No. H-1 Hyrad 10 point, 9ZN type. 10.50

QUENCHED GAPS

No. G-1 Amrad 1 K.W. Size.....\$41.50
No. G-2 Amrad $\frac{1}{2}$ K.W. Size..... 24.50
No. G-3 Amrad $\frac{1}{4}$ K.W. Size..... 12.00

"PITTSCO"

The Sign of Service and
Prompt Delivery
All We Ask Is a Trial!

"REMEMBER"

When you say "PITTSCO" you think
of Everything in Radio!

TRANSFORMERS (Transmitting)

No. F-1 Acme 500 Watt with Bakelite panel, completely mounted. \$30.00
No. H-1 Acme 1000 Watt with bakelite panel, completely mounted. 45.00
No. P-1 Thordarson, 250 Watt Type "R" old model..... 15.00
No. P-2 Thordarson 500 Watt Type "R" 24.00
No. P-3 Thordarson 1000 Watt Type "R" 39.00
Note—These Thordarson transformers are splendid values at above prices.

CW INDUCTANCES

Type 181 Tuska \$7.50
Type 181A Tuska, K.W. type 5.00
Type 182 Tuska (Magnetic type)..... 10.00
Type 183 Tuska (Tickler type)..... 12.50
Type 170 Tuska Filter 16.00

CW TRANSFORMERS (Phone Work)

Acme 200 Watt, mounted \$20.00
Acme 200 Watt unmounted..... 16.00
Acme 50 Watt mounted 15.00
Acme 50 Watt unmounted..... 12.00

CHOKE COILS (Phone work)

Acme $1\frac{1}{2}$ Henry 500 MA double coil. \$8.00
Acme $1\frac{1}{2}$ Henry 500 MA single coil 6.00
Acme $1\frac{1}{2}$ Henry 150 MA double coil 6.00
Acme $1\frac{1}{2}$ Henry 150 MA single coil 4.00

F. D. PITTS CO., Inc. Dept. E. 12 Park Square, BOSTON, MASS., U. S. A.

THE THIRD EDITION OF THE

Consolidated Radio Call Book

Very Greatly Enlarged--Will be Ready January 25th

192 pages. (32 pages more than 2nd edition,) better paper, stiff covers, etc.

Some of the special information contained in the new book: Radio rate sheet (charges to and from vessels, etc.); Weather reports and hydrographic reports of the world; Time signal section of the world; American radio compass stations; French radio compass stations; British radio compass stations; Canadian radio compass stations; General information section; International abbreviations; High power radio stations of the world; Press schedules of spark stations.

The Consolidated Radio Call Book is the only book in print officially listing all the Radio calls as issued by the Bureau of Commerce. Every vessel and land station in the world is represented and listed alphabetically, according to names of vessels or land stations, and according to call letters; Revision of American coastal stations under U. S. Naval control, and their new calls.

EVERY NEW AMATEUR CALL IS LISTED

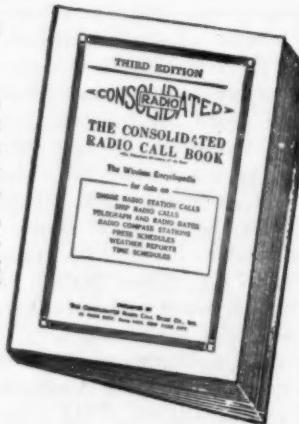
SPECIAL—Wireless Map of the World in Colors Given Free with Each Copy

Price \$1.50, Postpaid :

Either Direct From us or for Sale by the Following Responsible Dealers:

California Electric Co., San Francisco, Cal.
Meyberg Co., Leo J., San Francisco, Cal.
Catton, Neill & Co., Honolulu, T. H.
Kluge, Arno A., Los Angeles, Cal.
Brode Electric Co., Los Angeles, Cal.
Western Radio Electric Co., Los Angeles, Cal.

Wireless Shop, Los Angeles, Cal.
Young Men's Christian Association, Los Angeles, Cal.
Southern Electrical Supply Co., San Diego, Cal.
Williamson Electric Co., H. E., Seattle, Wash.
Parks, Henry Francis, Butte, Mont.
Northwest Radio Service Co., Seattle, Wash.



Consolidated Radio Call Book Co., Inc.

BOX 141, PARK ROW, NEW YORK CITY

When writing to Advertisers please mention this Magazine

ADVANCE NOTICE OF A NEAR HAM

(Continued from page 217)

with the best oscillating characteristic that I can find.

On paper (!) it would seem that with the power from storage cells that I intend using, it would seem as though I OUGHT to get anywhere from 125 miles, reasonably (!) upward, by day, and from 1,000, upward, by night.

Being an out-and-out fisherman and big game purser, it has occurred to me that it might be a decided novelty for me to "broadcast" on my lil' 200 meters, each night, after April 1st, the fishing news of our wonderful waters here—that teem with the finest game fish of the seven seas—and I have fished in 'em ALL! Also the weather conditions, names of sportsmen on the Island, and where they hail from, their catches, notes on the largest fish of each day—in short, any news that, as a newspaper man of many years, I think would be of interest to inland dwellers—those who might care to "listen" to me, o' nights.

My idea is to "broadcast" for, say 15-20 minutes, so as not to "hog," or have the appearance of trying to "hog," the air. If fellow-amateurs approve of this scheme, and will give me half a chance to work, I'll guarantee a few minutes of fun and "news" each night!

I am open, however, for all criticism—favorable and otherwise! Letters addressed to me at Avalon, Catalina Island, California, will reach unto my digits—duly—and I shall be glad to answer missives requiring acknowledgment. When the transmitter is installed I shall also be very happy to answer any questions about the fishing, etc., etc., and the EXACT hours that my call will "raise" me will be published in this magazine.

In order to obtain data, and to reimburse distant assistants for their trouble to this end, I shall send a check for \$5 to ye editor of "P. R. N.," if he approves, said sum to go **each month** to the operator that month who reports to me by mail having heard me at the **greatest distance**. In order to eliminate fakirs I shall send, at a stated hour each night, an **easy sentence of four words**—no figures or abbreviations—and each night the SAME. They will be sent slowly and steadily for, say, three minutes. And to him who posts me a report of his having heard them, and quotes them, from the farthest away, goes the "V."

All this providing Friend ED sees fit to lend editorial favor to the idea!

I trust that you fellows will hold out a helping welcome to the "fisherman" among ye!

We will be glad to act as the "half-way station" for passing along the five spots to the monthly victors, but we are of the opinion that you will have to sell a lot of fish to keep both sides of the ledger clear.—Ed.

Perhaps some of these stations would be interested to know they are received QSA at Calexico, Cal. The following, 6JN, 6EB, 6PZ, 6WM, 6AG, 6WK, 6KP, 6IF, 6BJ, 6IG, 6PR, 6ZM, 6LA, 6KM, 6EJ, 6EN, 6AK, 6SK, 6LN, 6PD, 6XD, and 6DP have been received with the greatest audibility to date. No amplification necessary.

A VACUUM TUBE UNIT

Will greatly increase the receiving range of your station. The combination shown opposite consists of the "A-M" Detector Unit and the Radiotron U. V. 200 tube. This makes a complete V T Detector outfit—well within the reach of every amateur.

Price, complete, \$11.00

The greatest value ever offered!
Send in your order today



The "A-M" Vacuum Tube Unit

Incorporates in a single unit, a VT socket, filament rheostat, grid condenser, grid leak, and binding posts. Mounted composition base.

Get one at once,
and mount your own VT. Price \$6

Order your NEW Radiotron Tubes from Us

Radiotron U.V. 200

THIS NEW detector and amplifier is the latest product of the research laboratories of the General Electric Company. It has been specially designed to meet the requirements of the amateur and experimental field, viz: the production of a tube which would prove a sensitive detector and a superior amplifier, and which could be operated off a single standard 22½ volt plate battery.

Radiotron U. V. 200 is the best radio detector and audio frequency amplifier yet produced. It is particularly adapted to standard regenerative circuits, in which it functions with greater sensitivity and stability than any other tube.

Best detector action is provided by a grid condenser of 0.00025 MFD capacity and the Radio Corporation's standard grid leak of $\frac{1}{2}$ MEGOHM resistance. The plate voltage must be closely adjustable from 18 to 22½ volts. The requisite variation of the plate voltage must be obtained in three ways: (1) By a standard "B" battery potentiometer; (2) by a "B" battery with taps to each cell; (3) by a special "A" or filament battery

potentiometer of 200 ohms which will be manufactured by the Radio Corporation. In the case of the last-mentioned method the negative terminal of the "B" battery (which is tapped from the 12th cell) connects to the variable contact on the "A" battery potentiometer.

Radiotron U.V. 201

THE TUBE is also a newly designed detector and amplifier of the pliotron type, which was developed in the General Electric Company's research laboratory. Experts who have tested this tube pronounce it to be the most efficient and stable amplifier available to date. The normal plate voltage is 40 (2 standard "B" batteries), but plate E. M. F.'s up to 100 volts may be used with increasing amplification. Price \$6.50.

All Radiotrons are manufactured in accordance with rigid specifications, assuring a uniform product.

They are made to fit standard four-prong sockets. Watch future announcements for data concerning the other types of tubes and devices which will be soon placed on the market.

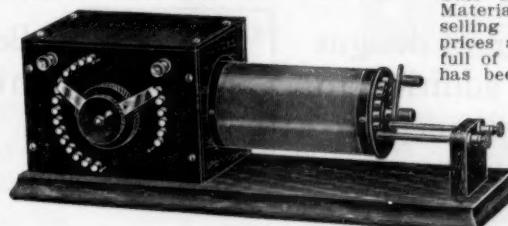
The NEW Radisco Better "B" Batteries (Tapped), 22½ volt, 15 cell, with variable voltage feature.....\$2.65

ATLANTIC RADIO CO., Inc.

88 Broad St.
Boston, 9, Mass.

Branch, 15 Temple St.
Portland, Maine.

Arnold Navy Type Loose Coupler



Send 3c stamps for Bulletin No. 3

PRICE, \$20.00

This Instrument is made of the best material obtainable and is equal to others selling for \$25.00 and higher, all fancy prices and frills are eliminated, is chock full of value and is made by a man who has been before the public for the past 8 years making Wireless apparatus.

It will tune up to 3,500 meters.

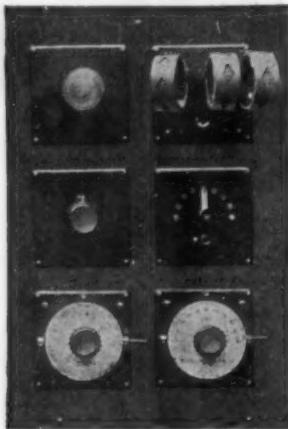
I also stock the finest line of switch points, Hard Rubber knobs, Cabinets and accessories on the market. Prompt delivery of all orders has distinguished me.

J. F. ARNOLD
Established 1910
2082 LEXINGTON AVENUE
NEW YORK CITY



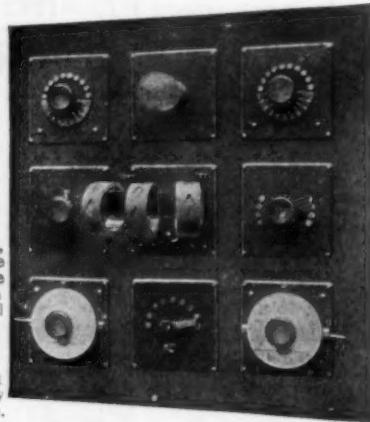
Newest Ideas in DeForest Unit-System Receiving Apparatus

ADVANTAGES of the Unit-System include extreme economy due to the simplicity and interchangability of the Units; convenience in arranging circuits of the individual need; and greater operating efficiency due to the engineering design and quality of the instruments. The Unit Sets shown here are examples.



SIX PANEL UNIT SET

comprising a combined Tuner and Detector to receive all local stations and practically any large station in the world. Everything necessary for the operation of the set, including detector tube, "B" battery, head phones and a set of 11 coils, can be had for \$75.00 complete. (Purchaser to furnish panel board and "A" battery). This set will give greater satisfaction than any outfit at anywhere near this price. Expansion possibilities unlimited.



NINE PANEL UNIT SET

comprising the same six panels shown above, and either three additional panels to give one step of amplification, or three panels to increase the efficiency of the original six. The former will add about \$23.70 to the cost of the original six; the latter about \$12.10.

DEFOREST APPARATUS PRICES REDUCED

Prices on DeForest Radio Apparatus have been reduced until present prices are practically the same as were effective about one year ago.

DeForest Radio Telephone & Telegraph Co.

Manufacturers and Inventors of High Grade Radio Apparatus
1415 SEDGWICK AVENUE NEW YORK, N. Y.

Lee DeForest, Inc., Western Distributors
451 THIRD STREET, SAN FRANCISCO



LOOK!!

A Yearly Subscription to QST and Pacific Radio News for \$3.25
You Save 75c.

Pacific Radio Pub. Co. - 50 Main St.
San Francisco, Cal.

RADIO CLUB PINS

Special folder of designs
and prices in addition to
regular catalogue free
on request.



Be sure to see these new
numbers, which will
put new life in
your club

METAL ARTS CO. Dept. 9 Rochester, N. Y.



Professional Radio Equipment at
Amateur Prices!

IT TOOK three years to develop the ABC line of Standardized radio apparatus. Many of the instruments, and all of the small parts are now ready for the market. Automatic machines are turning them out quicker, better and cheaper than ever before. Send a nickel for our advance booklet. It describes the small parts, the ABC sectional unit cabinets, the variable condenser, the new mica grid condenser, the Vibratone, Jr., etc.

Send for the booklet to-day. You'll find it interesting.

WIRELESS EQUIPMENT CO., Inc.
188 GREENWICH ST. NEW YORK

--And Did You See That First Issue of RADIO TOPICS

If not, you don't know what you have missed because it contained the latest and most interesting topics on radio. Better not miss the March issue as it will contain many pleasant surprises.

RADIO TOPICS is published monthly by the Chicago Executive Radio Council in the interest of all amateur radio.

Save a dollar by subscribing now!
Sign the blank below and mail it in with a dollar.

"RADIO TOPICS"
4533 No. Sawyer Ave.,
Chicago, Illinois.

Herewith one dollar for which
please send me RADIO TOPICS
for one year.

Name _____

Address _____

Audion Control Panels

Panel size 4x6½ in. of Polished Forkica, use V. T. or Auditron Tube, Rheostat, Grid condenser, B battery control, 6 binding post, mounted on brackets, all metal parts highly nickel plated and polished, 30 day special price \$6.25 prepaid.

One Step Amplifier

Panel size 4x6½ in. 30 day special price \$12.25 prepaid.

Two Step Amplifier

Panel size 6½x8 in. 30 day special price \$22.50 prepaid

Ask for Illustrated Literature Free

Keystone Radio Company

Manufacturers and Dealers

Drawer 307

GREENVILLE, PENN.

\$5.00

A Combination of the Three Leading Radio Magazines in the Field

RADIO NEWS—QST—PACIFIC RADIO NEWS

One year subscription to all three, only \$5.00
If ordered individually a yearly subscription to all three would cost
you \$6.00. Subscribe now and save a dollar.

PACIFIC RADIO PUB. CO.

50 Main St., S. F., Cal.

Storage Batteries

You can buy that storage battery through this association and save considerable money securing fast delivery. The same applies to many other radio instruments of standard make.



T-3 20-40 ampere hour	\$16.25
T-4 40-60 ampere hour	20.00
F-1 60-80 ampere hour	19.00
F-2 80 up ampere hour	24.00

The above batteries are capable of furnishing 6 volts at 1 ampere for periods stated and are the most economical source of tube filament heating current.

We supply a complete line of all standard radio goods on which you secure SERVICE and SAVING when you buy through us.

Send Stamp For Detailed Information

Dept. P.

Mutual Purchasers Association

2-4 STONE ST., NEW YORK CITY

Used Apparatus

Bought, sold and exchanged. We also carry a line of new apparatus, supplies and highly tested transformer and condenser oil.

Mail inquiries will be given our prompt attention. Send for list of used apparatus.

METEOR ELECTRIC CO.
309 SO. FLOWER STREET
LOS ANGELES, CAL.

--RADIO INSTITUTE-- OF AMERICA

Conducted by the greatest and most experienced radio telegraph organization in the world.

Thorough training given in radio operating, traffic, and in damped and undamped systems.

Tuition ten dollars a month for either the day or evening sessions or both combined.

RADIO CORPORATION OF AMERICA
Phone Douglas 3030 335 New Call Bld., San Francisco

EXPERIMENTERS
who send orders to the G. A. never experience endless delays and needless letter writing.

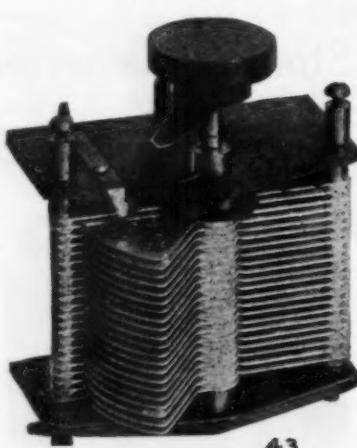
Grid Condenser ... 35c
Phone Condenser ... 35c
Gridleak Condenser ... 50c
Add 5c for mailing

All Over the World

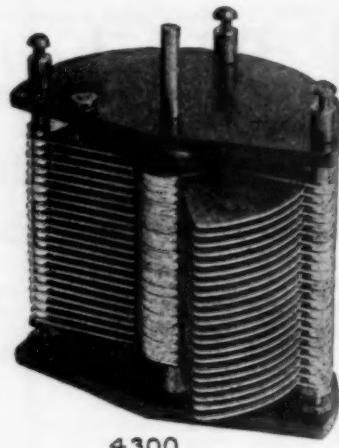
In nearly every country of every continent, from Bombay to Cape Town, from Madrid to Rio, from Sidney to Hawaii, G. A. Condensers are in service, replacing expensive fixed condensers or grid leaks and grid condensers. Many manufacturers use them as standard equipment on their apparatus. You To



THE GENERAL APPARATUS COMPANY, Inc., 570-P West 184 St., NEW YORK CITY



43



4300

Announcing a New Variable Condenser

Built along the same general lines as our SERIES "S" condenser, but heavier construction throughout. The plates are die-stamped from $1/32"$ hard rolled aluminum, and are separated by heavier spacers. Extreme rigidity, best of materials, accurate machine work and careful assembly are the outstanding features of construction. At the present time we are unable to fill orders for the SERIES "S" condenser, as we are unable to obtain materials for its construction, but we can ship the NEW SERIES "T" and the SERIES "L" VARIABLE CONDENSER from stock.

REMEMBER—WE ABSOLUTELY GUARANTEE SATISFACTION OR YOUR MONEY BACK.

SERIES "T"

No. 20	2 plate	VERNIER	\$2.00
No. 70	7 "	.0001 m.f.	2.35
No. 130	13 "	.0002 m.f.	2.75
No. 170	17 "	.0003 m.f.	3.15
No. 230	23 "	.0005 m.f.	3.60
No. 310	31 "	.0007 m.f.	4.30
No. 430	43 "	.001 m.f.	5.25
No. 630	63 "	.0015 m.f.	7.50

Include postage for one pound

PRICES

SERIES "L"

No. 2300	23 plate, .00075	\$ 6.00
No. 4300	43 plate, .0013	8.00
No. 6300	63 plate, .002	10.00

Either style of condenser fitted with indicating dial at additional cost of 75c.

Include postage for two pounds

The Wireless Shop

511 W. WASHINGTON STREET

A. J. Edgcomb

LOS ANGELES, CAL.

The Latest Gaseous Vacuum Tubes

make necessary the use of a variable voltage. And what method of variation is more convenient, efficient and economical than that employed in the "VARIABLE STANDARD VT BATTERY?"

The "VARIABLE STANDARD VT BATTERY" combines all the desirable advantages of cast en bloc batteries with the additional feature of close variation without current loss. Each cell is tapped,

thus allowing variation by steps of $1\frac{1}{2}$ volts—from $1\frac{1}{2}$ volts to $22\frac{1}{2}$ volts.

Should your tube require more than $22\frac{1}{2}$ volts, add either our Type No. 7623 STANDARD VT BATTERY, or Type No. 7625, for the initial $22\frac{1}{2}$ volts. With tubes requiring less than $22\frac{1}{2}$ volts, use Type No. 7650 "VARIABLE STANDARD VT BATTERY."

For long service we recommend Type No. 7623, \$1.50. For longer service Type No. 7625 at \$2.65, or Type No. 7650 (Variable) at \$3.50 are recommended. \$5.00 will buy 45-volts, with the last $22\frac{1}{2}$ volts variable—use No. 7623 and No. 7650 units.



Type No. 7623



(Pat. Applied For) Type No. 7650

LET YOUR DEALER KNOW YOU WANT WHAT YOU WANT BY ASKING
FOR A "STANDARD VT BATTERY" AND NOT FOR A "B" BATTERY

RICHTER-SCHOTTLE CO., MFRS.

198 ROEBLING STREET
PACENT ELECTRIC CO., Sole Eastern Agents, 150 Nassau St., NEW YORK CITY

Dealers—Write for Discounts

BROOKLYN, N. Y.

Classified Advertisements

ADVERTISEMENTS IN THIS SECTION ARE THREE CENTS PER WORD NET. REMITTANCE, IN FORM OF CURRENCY, MONEY ORDER OR STAMPS, MUST ACCOMPANY ORDER.

RADIO PHONISTS, ATTENTION—HIGH VOLTAGE GENERATORS. We supply motor generator units in various capacities, especially designed for radio phone work. Low powered rotary converters, dynamotors, fractional H. P. motors, storage batteries. Various types of meters, condensers, navy type "4" nickel plate brass engraved dial, spark gap rotors, SYNCHRONOUS SPARK GAPS. RAY-DI-CO RADIO PHONE sets furnished knocked down ready for assembling and your connection. Get acquainted with our SERVICE. RAY-DI-CO, 2653C N. Clark St., Chicago, Ill.

EXPERIMENTERS! Laboratory apparatus, scientific instruments, chemicals, etc., reach you in very short time when bought from AMIDO APPARATUS COMPANY, 3118 14th St., Washington, D. C. Our prices are guaranteed to knock other firm's prices sold. Catalog and big scientific mail, 5c, stamps.

HONEYCOMB COILS cheapest on the market. Just as good as the best. Note these prices: 25 turns, 45c; 35 turns, 45c; 50 turns, 55c; 75 turns, 60c; 100 turns, 65c; 150 turns, 70c; 200 turns, 75c; 250 turns, 80c; 300 turns, 85c; 400 turns, 90c. Postage extra. Superior Coll Co., 1831 Balboa St., San Francisco, Cal.

Our advertisement, page 226. Discriminating amateurs use our instruments. Absolute satisfaction guaranteed. HI-Grade Wireless Instrument Co., Asheville, N. C.

COMMERCIAL Type Rotary Spark Gaps with hard rubber uprights and bakelite rotor. Motor will operate on 110 volts, A. C. or D. C. Best buy on the market. \$12. Add postage on 11 pounds. Radio Development Co., P. O. Box 2114, San Francisco.

HURRY and read our advertisement on page 226. HI-Grade Wireless Instrument Company, Asheville, N. C.

ALL amateur apparatus bought or made in accordance with the Radio Buyers' and Builders' Handbook invariably resell very profitably. Study my June, July, October and December display advertisements. See why and get your copy. R. Clark, Barnes Road, Newton, Mass.

FOR SALE—One 3,000 Meter Tresco Tuner; two weeks' use; \$8. postpaid. D. G. Strawn, Calexico, Cal.

FOR SALE—Clapp Eastham loose coupler, \$12; Murdock .001 variable, \$4; Audiotron, \$4.75; Remler control panel, \$11, cost \$15; Murdock Tuning Coil, \$2.50; DeForest crystal detector, \$2; postage extra. Wanted honeycomb coils. James Walker, San Dimas, Cal.

NO TUBES SOLD

without complete instructions for operating efficiently.

ELECTRON RELAYS and A-P AMPLIFIERS

personally tested on actual receiving. A new tube or your money refunded if you are not satisfied.

B. F. McNamee

2436 Stuart St., Berkeley, Calif.

REYNRAD SPECIALTIES

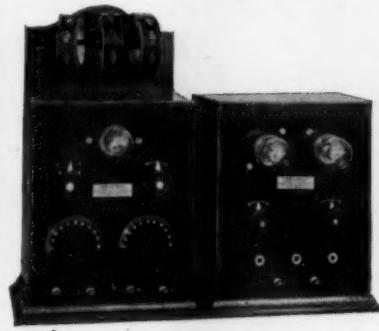
SUPERIOR RECEIVING EQUIPMENT

The Reynrad RR-74 Multiwave Tuner and Audion Detector is an exceptionally fine receiving outfit mounted as a cabinet unit and within the reach of all. When used in conjunction with our RA-72 Two-Step Amplifier at our Testing Station, music and Radio Phone conversations have been heard from both coasts—an exceptional record.

With our RCR-30 complete receiving set, ships have been readily heard over a distance of 1500 miles, mostly overland and amateurs copied over 1000 miles away. These receiving records place the Reynrad RCR 30 on a par with numerous audion sets.

These instruments are compact and artistic in design.

RR-74 Multiwave Tuner and Detector with bulb only.....	\$60.00
RA-72 Two-Step Amplifier, with bulbs.....	\$55.00
RCR-30 Crystal Receiver Set, with 3000 ohm Phones	\$30.00



RR-74 and RA-72

REYNRAD SHORT WAVE COILS

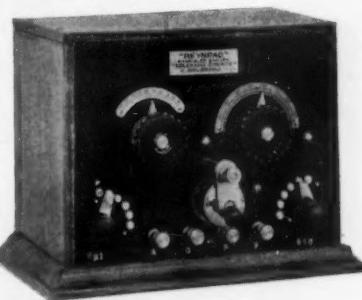
Just what you have been looking for. Single Layer inductances, wound on heavy 4-inch Bakelite tubes, with standard De Forest plugs. A set of three will bring in amateur stations as you never have heard them before. An additional secondary coil will make your receiving outfit equally efficient up to 600 meters. State wave length desired, 175-300 or 300-600.

Reynrad Short Wave Coils.....\$2.00 each
Standard De Forest Plugs for H. C. or
D L Coils\$.65 each

We carry a large stock of Standard apparatus and supplies. Acme, Murdock, Clapp-Eastham, Magnavox and De Forest Agents.

Send 6 cents in stamps for catalog and we will also place you on our mailing list.

Correspondence Solicited
REYNOLDS RADIO SPECIALTY CO.,
729 South Prospect Street
COLORADO SPRINGS COLORADO



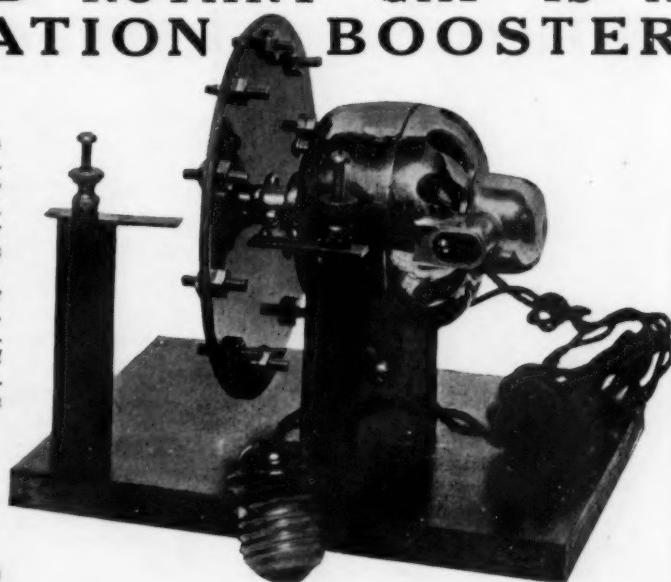
RCR-30, CRYSTAL SET

LET THIS BE YOUR NEW YEAR'S RESOLUTION—

Resolved—That I will Use a Good Rotary Gap Throughout the Year of 1921 and Will Cease to Jam the Air With that Inefficient, Mushy Spark.

A GOOD ROTARY GAP IS A RADIATION BOOSTER

The illustration shows our commercial type Rotary Gap with 110 Volt Motor. Will operate on either A. C. or D. C. Ten Stud Motor, constructed of best grade Bakelite Hard Rubber Stationary Electrode Supports. Cord and Plug Attachment Supplied with each Gap.



\$12.00

Include Postage on eleven pounds

THIS GAP WILL HANDLE ONE KILOWATT SAFELY. ROTARY AND STATIONARY ELECTRODES ARE EASILY RENEWED.

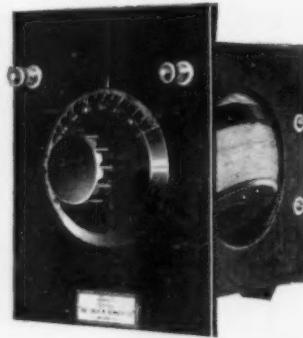
Our New Bakelite Audion Control Panel with V.T. Socket, Rheostat, "B" Battery Switch, Nickeled Binding Posts and Brackets for Table Mounting, \$8.00.

RADIO DEVELOPMENT COMPANY

Manufacturers of High-Grade Radio Apparatus

SAN FRANCISCO

P. O. BOX 2114



**KENNEDY
EQUIPMENT**



VARIOMETER AND VARIOCOUPLER

IN FULL KEEPING WITH THE HIGH QUALITY KENNEDY LINE

TYPE 909 VARIOMETER \$8.50

Type 909 Variometer with special Kennedy commercial type bakelite knob with nickel-plated brass bushing and 3-inch bakelite dial. \$ 9.90
Type 905 Mounted unit as illustrated above. \$12.25

TYPE 919 VARIOCOUPLER \$7.00

Type 919 Variocoupler with special Kennedy commercial type bakelite knob with nickel-plated brass bushing and 3-inch bakelite dial. \$8.40
Type 915 Mounted unit as illustrated above... \$11.75

Send for Bulletin 901 for more complete description

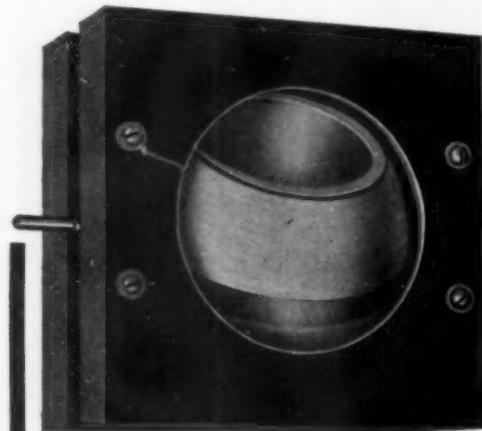
**ABSOLUTELY AND UNCONDITIONALLY GUARANTEED TO GIVE
COMPLETE SATISFACTION**

Sent POSTPAID on Receipt of Price if Your Dealer Can't Supply You.

THE COLIN B. KENNEDY COMPANY

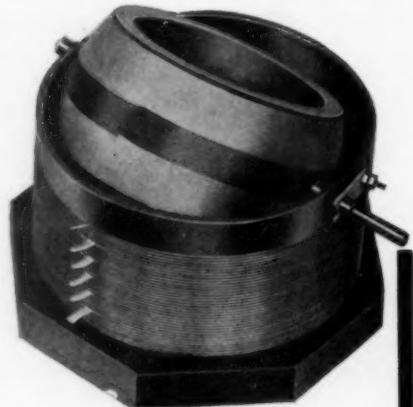
RIALTO BUILDING

SAN FRANCISCO



“CESCO”

—is the trade name given the low-priced, high-quality, guaranteed apparatus distributed exclusively by the California Electric Supply Co. of San Francisco. Buy “CESCO,” save money, and be satisfied. If your dealer cannot supply you with the following—write us direct.



Note the low price

\$8 50

CESCO VARIOMETER

V-100—CESCO Variometer for the grid and plate circuits of short wave regenerative receivers. Correctly designed and carefully constructed of thoroughly seasoned hard maple—cannot and will not warp, shrink, or crack, as soft wood variometers frequently do. All windings bound and insulated with CESCO special impregnating compound. Price, postpaid—\$8.50. Order number V-100.

CESCO VARIOCOUPLER

C-100—CESCO Variocoupler for use in connection with CESCO variometer. The secondary is ball type. Primary consists of a threaded tube 4 inches in diameter and 2 inches high, made of unshrinkable composition and wound with large-gauge bare copper wire. An efficient instrument, sturdy and durable. CESCO VARIOCOUPLER complete, mounted on hardwood base for panel mounting, retail price—\$6.75. Order number C-100.

\$6 75

Any other supplies you need now? We have them. And your inquiries are welcome as your orders. We supply every want the way you want it supplied.

DEALERS—
WRITE US

DEALERS—
WRITE US

CALIFORNIA ELECTRIC SUPPLY CO.
643 MISSION STREET, SAN FRANCISCO

“Radio Supplies That R Right”



The Recognized Symbol of Superior Performance



When You Make It, Make It **RIGHT**

Most any operator can make an instrument which WORKS. But the product of the home work-shop which both works and looks right is a rare article, usually coming from the hand of the expert craftsman who spends hours of valuable operating time on finesse. You who have limited tools, limited time and limited patience for building equipment will find the most satisfactory answer to the construction problem in Amrad Cabinets, Panels and Parts.

VARIETY. There is an Amrad Cabinet for every purpose, available with or without panels. Put a Coupler Unit in Type A, put a 2-stage amplifier in Type B or a complete Regenerative Receiver in Type C. The Type C cabinet takes a 10x10 panel which may be easily mounted flush or below flush by means of Amrad Panel Brackets.

STANDARDIZATION. The five-inch standard is by far the most logical and best known. Natural gloss finish is becoming more and more the standard finish everywhere. Three-inch metal dials, non-removable top binding posts, anti-capacity switch points, dull nickel finish of all metal parts are points of standardization that have become generally accepted in the past year and adopted by Amrad.

APPEARANCE. All Amrad Cabinets harmonize perfectly in finish. Any number of cabinets may be assembled together as a compact unit by means of Amrad connectors. Such an assembly is particularly pleasing in appearance. Dial etchings, binding posts, switch points, etc., stand out in sharp contrast against the dull black panels.

EFFICIENCY. The exclusion of dust and dampness from the windings and circuits of receiving apparatus is of supreme importance. Few operators recognize this and consequently often fail to work maximum distances. Adequate protection from mechanical damage will also repay the builder in the long run.

	Cabinet-Panel
Type A 5x5	\$ 3.00
Type B 10x5	5.00
Type C 10x10	10.75

	Cabinet Only
	\$2.00
	3.25
	5.65

	Panel Only
	\$.75
	1.50
	4.50

Send for Bulletin R for further information. If your dealer cannot supply you with the latest Amrad bulletins send us his name and we will put you on our mailing list.

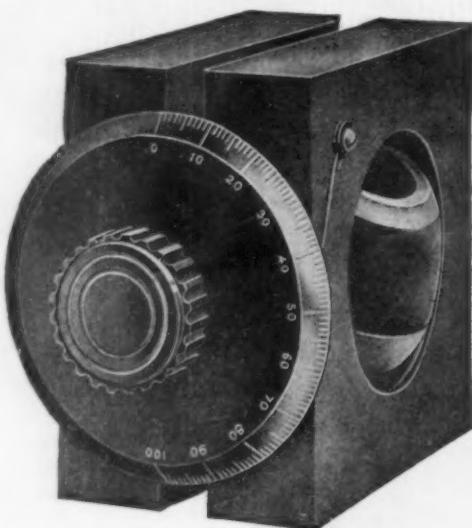
AMERICAN RADIO AND RESEARCH CORPORATION

2420 Park Row Building
New York

Address all Communications to New York Office

Factory and Laboratory
Medford Hillside, Mass.

THREE RADISCO FEATURES



One distinct feature of Radisco Service is the close co-operative ness of each individual Radisco instrument with the other, and the strength of signal derived from such contact is marvelous.

The other two are the Radisco Variometer and Coupler described below. It is impossible to go wrong when you use them together.

RADISCO VARIOMETER

Like all other Radisco products it has been produced to anticipate and supply the demand for a good short-wave instrument qualified to stand the acid tests of radio work, and built at a price consistent with the cost of manufacture, which has always been a Radisco characteristic.

For the radio man who desires an instrument of this character, our Variometer makes a distinct appeal. It is made in one size and of one quality, the best. The extreme dimensions are 4 3-4 inches high, 3 inches wide, 5 inches deep and the shaft is of 1-4 inch brass, just the right size to fit the No. 69 dial; forms are carefully turned from thoroughly seasoned wood and substantial brass bearings provided. The price is strictly an innovation and should appeal to the most conservative.

Number 1 Variometer \$7.00
Number 1D Variometer with dial \$8.50
Shipping weight 3 pounds

Radisco Coupler

Specially designed for use with the No. 1 Variometer

The stationary winding consists of 37 turns in groups of six turns and single turns. Strength and high insulation insured by use of Bakelite tubing. Brass bearings support thoroughly seasoned wooden ball; Brass shaft of standard size to fit the No. 67 Corwin dial projects far enough for Coupler to be readily mounted. The whole instrument is finished off on a neatly varnished wooden base.

No. 2 Coupler (as illustrated) \$8.50
No. 2D Coupler with "dial" \$9.75

Shipping weight 3 pounds

The agents listed below carry all Radisco products and they will be glad to consult with you on the new Radisco Coupler

ALBANY, N. Y.

Shotton Radio Mfg. Co.,
8 Market St.

ASHEVILLE, N. C.

Hi-Grade Wireless Instrument Co.

BALTIMORE, MD.

Radio Engineering Co.,
614 No. Calvert St.

BEINVILLE, QUEBEC, CAN.

Canadian Radio Mfg. Co.

BOSTON, MASS.

Atlantic Radio Co.,
88 Broad Street

BROOKLYN, N. Y.

Kelly & Phillips,
312 Flatbush Ave.

CHICAGO, ILL.

Chicago Radio Laboratories,
1316 Carmen Ave.

EUREKA, ILL.

Klaus Radio Co.,
Branch, Peoria, Ill.

KANSAS CITY, MO.

McCreary Radio Supply,
4th & Delaware Sts.

LOS ANGELES, CALIF.

The Wireless Shop,
511 W. Washington St.

NEW ORLEANS, LA.

Rose Radio Supply,
604 Gravier St.

NEWARK, N. J.

A. H. Corwin & Co.,
4 West Park Street

NEWCASTLE, PA.

Pennsylvania Wireless Mfg. Co.,
507 Florence Ave. "8HA"

OMAHA, NEBRASKA

O-B Radio Supply Co.,
406 Brown Building.

PHILADELPHIA, PA.

Philadelphia School of Wireless
Telegraphy,
Broad and Cherry Streets.

PROVIDENCE, R. I.

Rhode Island Elec. Equip. Co.,
45 Washington Street.

PORTLAND, ME.

Atlantic Radio Co.,
15 Temple St.

PITTSBURG, PA.

Radio Electric Co.,
3807 5th Ave.

SEATTLE, WASH.

Northwest Radio Service Co.,
609 Fourth Ave.

SCRANTON, PA.

Shotton Radio Mfg. Co.,
P. O. Box 3
Branch 8 Kingsbury St.,
Jamestown, N. Y.

ST. LOUIS, MO.

The Benwood Co., Inc.,
13th and Olive Street

TORONTO, ONT., CAN.

The Vimy Supply Co.,

567 College Street.

WICHITA, KAN.

The Cosradio Co.,
1725 Fairmont Ave.

*Responsible Dealers: Write for interesting sales proposition on Radisco Apparatus
If none of the above agencies are in your vicinity, or do not give you the desired
information on Radisco Apparatus, communicate with*

RADIO DISTRIBUTING COMPANY : : Newark, New Jersey

